Martinsville Southern Connector Study
Route 220 Environmental Impact Statement

MARCH 2020

Draft Environmental Impact Statement and Draft Section 4(F) Evaluation

State Project #: 0220-044-052, P101; UPC: 110916
Federal Project #: STP-044-2(059)

Prepared in Coordination With:

U.S. Department of Transportation
Federal Highway Administration

FHWA-VA-EIS-20-01-D

MARTINSVILLE SOUTHERN CONNECTOR STUDY

DRAFT ENVIRONMENTAL IMPACT STATEMENT
and
DRAFT SECTION 4(f) EVALUATION

Submitted Pursuant to:
42 U.S.C. §4332(2)(C) and 49 U.S.C §303

Submitted by:
U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
and
VIRGINIA DEPARTMENT OF TRANSPORTATION

In Cooperation with:
U.S. Army Corps of Engineers
U.S. Environmental Protection Agency

2/24/2020
Date of Approval

Angel Deem
Angel Deem, Environmental Division Director
Virginia Department of Transportation

2/25/2020
Date of Approval

Thomas Nelson, Jr., P.E., Division Administrator
Federal Highway Administration

The following persons may be contacted for additional information concerning this document:

Ms. Angel Aymond
Virginia Department of Transportation
1401 East Broad Street
Richmond, Virginia 23219
(804) 786-5344

Mr. Mack Frost
Federal Highway Administration
400 North 8th Street, Suite 750
Richmond, Virginia 23240
(804) 775-3352

The purpose of this study is to evaluate potential transportation improvements to enhance mobility for both local and regional through traffic traveling along the U.S. Route 220 corridor between the North Carolina state line and U.S. Route 58 near the City of Martinsville, Virginia. The study includes analyses of a range of alternatives to address the following needs: accommodate regional traffic, accommodate local traffic, and address geometric deficiencies and inconsistencies. This Draft Environmental Impact Statement (EIS) identifies the Preferred Alternative (Alternative C), which would be a four-lane, access-controlled roadway primarily on new alignment, west of existing U.S. Route 220. Comments on this Draft EIS are due by April 20, 2020 and should be sent to Ms. Angel Aymond at the above address or submitted using the online comment form at www.virginiadot.org/martinsvilleconnector. The Federal Highway Administration does not intend to issue a combined Final EIS / Record of Decision.

State Project Number: 0220-044-052, P101; UPC: 110916
Federal Project Number: STP-044-2(059)

EXECUTIVE SUMMARY

EXECUTIVE SUMMARY

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the Federal Lead Agency and in cooperation with the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA), have prepared this Draft Environmental Impact Statement (EIS) for the Martinsville Southern Connector Study – Route 220 EIS (Martinsville Southern Connector Study). This study evaluates potential transportation improvements along the U.S. Route 220 (Route 220) corridor between the North Carolina state line and U.S. Route 58 (Route 58) in Henry County near the City of Martinsville (Martinsville), Virginia.

This Draft EIS has been prepared pursuant to the National Environmental Policy Act of 1969 (NEPA), codified in 42 USC §4321-4347, as amended, and in accordance with FHWA regulations, found in 23 CFR §771.

Consistent with the Council on Environmental Quality's (CEQ) regulations for the implementation of NEPA (40 CFR §1502.12), this Executive Summary provides information regarding the major conclusions and issues considered in this Draft EIS. Specifically, this summary discusses the Purpose and Need for improvements on the Route 220 corridor, alternative solutions considered to address the Purpose and Need, costs of the alternatives, potential environmental effects, agency coordination, public outreach, and the next steps for the study. This summary is presented in a question and answer format and includes commonly asked questions regarding the study. These questions are generally listed by the order in which a discussion of each topic is introduced in this Draft EIS.

ES.1 WHAT IS AN EIS?

An EIS is a document that takes the potential effects on the environment of any Federal action into consideration. NEPA requires Federal agencies to prepare an EIS when an action they are considering has the potential to significantly affect the environment. An EIS identifies the Purpose and Need for the action and provides a discussion of potential environmental impacts to inform decision makers and the public of reasonable alternatives. This Draft EIS is the first step of the procedural process prescribed in NEPA and provides an opportunity for the public, interest groups, and other agencies to review and provide comment on the proposed Federal action and Draft EIS. After circulation of the Draft EIS, a Final EIS is the second step of the process and focuses on any refinements of the data presented in the Draft EIS that are deemed necessary for completing the NEPA process. This includes, responding to any comments received on the Draft EIS, and documenting compliance or providing assurance that the Preferred Alternative would meet all applicable environmental laws and Executive Orders (EO). Upon completion of the EIS process, the Federal Lead Agency issues a Record of Decision (ROD) which identifies the Selected Action as a result of the study, after considering a reasonable range of alternatives and all practicable means to avoid or minimize environmental harm.

ES.2 WHO IS LEADING THE STUDY?

FHWA could authorize Federal funding for potential highway transportation improvements that may advance from the Martinsville Southern Connector Study; as a result, FHWA is the Federal Lead Agency for the environmental review under NEPA. VDOT is the statewide agency and study sponsor responsible for the administration of these funds for highway transportation improvements in the Commonwealth of Virginia. For the purposes of preparing this NEPA document and consistent with 23 USC §139(c)(3), VDOT is the Joint Lead Agency.

ES.3 WHAT IS THE MERGED PROCESS AND WHAT DOES IT MEAN FOR THE STUDY?

The environmental review process conducted as part of this Draft EIS has been carried out following the *NEPA and Clean Water Act (Section 404) Merged Process for Highway Projects in Virginia* (merged process), which is a memorandum of understanding between VDOT, FHWA, USACE, EPA, and the U.S. Fish and Wildlife Service (USFWS) that establishes the procedures for environmental reviews of transportation projects in Virginia. The merged process is intended to provide a more efficient evaluation of highway projects and facilitate the development of documentation that complies with the requirements of NEPA and provide sufficient information to support FHWA approval or Federal regulatory decision-making, including permits issued by other Federal agencies.

The merged process includes five milestones in which FHWA and VDOT request concurrence from the Concurring Agencies cooperating in the environmental review and development of documentation. The five concurrence milestones are environmental analysis methodologies; Purpose and Need; range of reasonable alternatives; identification of a recommended preferred alternative; and conceptual mitigation for potential impacts. The goal of the concurrence points is to eliminate the revisiting of decisions that have been agreed upon earlier in the environmental review process. FHWA and VDOT have obtained concurrence on each of the milestone steps for the Martinsville Southern Connector Study to support future permitting decisions that are anticipated in conjunction with the ROD. These concurrence points are discussed throughout this Draft EIS.

ES.4 WHAT IS THE ONE FEDERAL DECISION PROCESS AND WHAT DOES IT MEAN FOR THE STUDY?

The Martinsville Southern Connector Study also follows the One Federal Decision (OFD) process, enacted on August 15, 2017 by EO 13807: *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects* (82 FR 163). EO 13807 implements a policy for Federal Lead Agencies of major infrastructure projects to coordinate among any Cooperating or Participating Agencies involved in the NEPA review process to memorialize their findings, determinations, or approvals in synchronized ROD documents; this process is commonly referred to as OFD[1].

As part of OFD, specific timelines and milestones, such as permitting decisions under the Clean Water Act of 1972 (CWA) (33 USC §1251 et seq.), are established for the environmental review and authorization schedule, to ensure accountability and efficiency among all Federal agencies involved in the development and approval of major infrastructure projects. Specifically, OFD sets a government-wide goal of reducing the average time to complete required environmental reviews and authorization decisions for major infrastructure projects to not more than two years from publication of a Notice of Intent (NOI), through preparation of an EIS, to issuance of a ROD. OFD

[1] For more information on OFD please refer to the following website: https://www.environment.fhwa.dot.gov/nepa/oneFederal_decision.aspx.

also requires that major infrastructure projects have all necessary authorization decisions within 90 days of issuing the ROD, unless an exception applies[2].

Major infrastructure projects are defined by EO 13807 as projects for which multiple authorizations by Federal agencies would be required to proceed with construction, the Federal Lead Agency has determined that it will prepare an EIS under NEPA, and the project sponsor has identified the reasonable availability of funds sufficient to complete the project (82 FR 163, p. 40464).

ES.5 WHAT OTHER AGENCIES ARE INVOLVED IN THE STUDY?

In coordination with FHWA, VDOT has conducted an extensive outreach and engagement effort with Federal, state, regional, and local agencies, in addition to interested stakeholders and the general public, throughout the duration of the study. At the initiation of the study, a Coordination Plan was developed, in accordance with the requirements defined in 23 USC §139(g). The purpose of the plan was to establish the timing and formatting for interaction with the public and agencies during the study process to ensure adequate opportunities for participation throughout the study.

Agencies involved in the study include Cooperating and Participating Agencies. Cooperating Agencies are agencies other than a Lead Agency that have jurisdiction by law or special expertise with respect to any environmental resources potentially impacted. Participating Agencies are any Federal, state, tribal, regional, and local agencies that may have an interest in the study and the environmental review process. At the onset of the study, agencies and localities were invited to be Cooperating and Participating Agencies (see details provided in **Chapter 6: Comments and Coordination** of this Draft EIS). USACE and EPA have accepted invitations to be Cooperating Agencies for this study. As signatories of the merged process that accepted an invitation to serve as a Cooperating Agency, USACE and EPA were considered to be Concurring Agencies to provide input as well as concurrence or non-concurrence on specific milestones throughout the environmental review, which are outlined in the merged process. Several other Federal and state agencies, as well as localities within and adjacent to the study area, have served as Participating Agencies for the study. A complete list of the agencies and their role in the study is provided in the Coordination Plan (**Appendix B**). Agency correspondence received to date is included in **Appendix C**.

FHWA and VDOT have held, and will continue to hold, monthly meetings with the Cooperating and Participating Agencies to keep them informed and engaged in the environmental review process. The Concurring Agencies have provided written concurrence on the various elements of the Purpose and Need, alternatives carried forward for evaluation, the identified Preferred Alternative, and conceptual mitigation for unavoidable impacts. Concurrence on each milestone step in the study process was informed by discussions at monthly meetings and based on input from the Participating Agencies as well as the general public. The Cooperating and Participating Agencies have reviewed drafts of the supporting technical documents and this Draft EIS.

[2] After the Martinsville Southern Connector Study received OFD designation by FHWA in August 2018, FHWA, in consultation with the U.S. Secretary of Transportation and CEQ, determined that a two-year schedule from NOI to ROD was not practicable for this EIS. Instead, a schedule pursuant to 23 USC §139 has been developed, which is outlined in the Coordination Plan (Appendix B) developed in coordination with the Cooperating and Participating Agencies for this study. The environmental review timetable for the Martinsville Southern Connector Study can be found on the Permitting Dashboard for Federal Infrastructure Projects here: [www.permits.performance.gov/permitting-projects/us-route-58220-bypass-north-carolina-state-line-limited-access-study.](www.permits.performance.gov/permitting-projects/us-route-58220-bypass-north-carolina-state-line-limited-access-study)

ES.6 WHERE IS THE STUDY LOCATED?

The study area for the Martinsville Southern Connector Study is located south of Martinsville in Henry County, Virginia. Positioned on the southern border of Virginia, the study area is located approximately 60 miles southeast of the City of Roanoke (Roanoke) via Route 220, 30 miles west of the City of Danville via Route 58, and 40 miles north of the City of Greensboro (Greensboro) in North Carolina via Interstate 73 and Route 220.

The study area encompasses approximately seven miles of the Route 220 corridor, between the interchange of Route 220 with the William F. Stone Highway and the North Carolina state line. The study area is shown in **Figure 1-1: Study Area** included in **Chapter 1: Purpose and Need** of this Draft EIS. Within the study area, existing Route 220 consists of a four-lane roadway, with two travel lanes in each direction. The William F. Stone Highway is signed as Route 58 to the east of its interchange with Route 220; west of the interchange, Route 220 is collocated with Route 58 as both bypass Martinsville. The study area encompasses the Town of Ridgeway (Ridgeway), where Route 220 connects with Route 87 (Morehead Avenue).

The study area covers approximately 12,870 acres and generally encompasses a one-half-mile buffer around the portion of existing Route 220, between the North Carolina state line and Route 58, and each alternative carried forward for evaluation. The study area was used in various instances during preliminary research and to establish an understanding of the potentially affected natural, cultural, and social resources that may be impacted by the improvements evaluated in this Draft EIS. Additional details on the composition of the study area can be found in **Section 1.1.1**.

ES.7 WHAT IS AN ACCESS-CONTROLLED ROADWAY?

Limiting vehicular access to a roadway from other roadways is called access control. There are different degrees of access control: full access control via interchanges, partial access control, or uncontrolled access. The principal advantages of controlling roadway access are resulting improvements to the movement of vehicles and the reduction of crash frequency and severity (AASHTO, 2011). Providing access control on a highway serves to manage the interference with regional through traffic.

Access control management measures have been implemented on Route 58 to the west of the study area as well as on Route 220 north of the study area and south of the study area in North Carolina. Access to Route 58 and Route 220 north of the study area occurs via interchanges at selected public roads. This access control measure is called full access control. South of the study area, access is provided to Route 220 from selected public roads and private driveways through at-grade or grade-separated connections. This access control measure is called partial access control.

For the purposes of evaluating transportation improvements along the Route 220 corridor in the study area, full access control was assumed to represent the worst-case scenario for evaluating environmental impacts and associated costs. Full access control would add substantial infrastructure and require a larger footprint, relative to other access control measures; therefore, it represents the worst-case scenario. Specific access management options may be determined as the environmental review process advances, which could be documented in the Final EIS. Since the Commonwealth Transportation Board (CTB) has the authority to regulate limited access highways (§33.2-401 of the Code of Virginia) and the Commonwealth Transportation Commissioner is conferred the power to apply access management standards to preserve the efficient operation of the state highway system (§33.1-198.1 of the Code of Virginia), this determination may also be deferred until a later date when more detailed design advances and if funding for future phases of the project development process should become available. As a result, no commitments related to specific access control measures are made in this Draft EIS.

ES.8 WHAT IS THE PURPOSE AND NEED OF THE STUDY?

The Purpose and Need Statement explains why the Federal action is needed and serves as the primary criteria in the alternatives screening process. The purpose element of the statement explains the problem that the improvements evaluated in this Draft EIS are intended to address. The need element includes the data substantiating that a problem currently exists or is likely to occur. The data collected and evaluated for the Purpose and Need are provided in **Chapter 1: Purpose and Need** of this Draft EIS.

The specific needs for the Martinsville Southern Connector Study were developed based on a review of completed plans and previous studies, along with the analysis of current data and projected future conditions compiled for this study. Information was collected through meetings with Federal, state, and local agencies, as well as study stakeholders and the public.

The purpose of the Martinsville Southern Connector Study is to enhance mobility for both local and regional traffic traveling along Route 220 between the North Carolina state line and Route 58 near Martinsville, Virginia.

The Martinsville Southern Connector Study addresses the following needs:

- **Accommodate Regional Traffic –** current inconsistencies in access, travel speeds, and corridor composition along Route 220 inhibits mobility and create unsafe conditions considering the high volume of truck and personal vehicle traffic traveling through the corridor to origins and destinations north and south of the study area;
- **Accommodate Local Traffic –** numerous, uncontrolled access configurations along Route 220, combined with high through traffic movement, create traffic delays and contribute to high crash rates for travelers within the corridor accessing residences, commercial buildings, and schools; and
- **Address Geometric Deficiencies and Inconsistencies –** current geometric conditions along Route 220, such as lane widths, horizontal curves, and stopping sight distances, are below current design standards and vary along the length of the corridor, resulting in safety concerns for all users.

ES.9 WHAT ALTERNATIVES WERE EVALUATED?

VDOT, in coordination with FHWA, the Cooperating and Participating Agencies, and the general public, initially considered a broad range of alignment options to address the established Purpose and Need of the Martinsville Southern Connector Study. A number of these alignment options were not carried forward based on their inability to meet the Purpose and Need. Other alignment options were developed into alternatives for evaluation, but were not retained based on anticipated impacts to private property. As part of the public involvement process during the development of the Draft EIS, additional alternatives were suggested for evaluation. These options were similar to the alignment options initially considered and were not carried forward for evaluation based on their inability to address the Purpose and Need for the study.

The alternatives carried forward for evaluation and retained for detailed study in the Draft EIS are listed below:

- No-Build Alternative;
- Alternative A – New access-controlled alignment west of existing Route 220 with a new

interchange with Route 58 to the west of Route 641 (Joseph Martin Highway) and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line (see **Figure 2-8**);

- Alternative B – New access-controlled alignment west of existing Route 220 and west of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 58 and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line (see **Figure 2-9**); and
- Alternative C – New access-controlled alignment west of existing Route 220 and east of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 58 and reconstruction of the existing Route 220 alignment for approximately 0.5 miles from the North Carolina state line (see **Figure 2-10**).

These alternatives are described in **Section 2.5** and serve as the focus for the analysis included in this Draft EIS. Additional information is included in the Draft EIS and supporting ***Alternatives Analysis Technical Report*** (VDOT, 2020b), including the process used to identify and screen alignment options, alternatives carried forward, and alternatives retained for detailed study.

Based on the detailed study of the alternatives retained for evaluation, Alternative C has been identified in this Draft EIS as the Preferred Alternative.

ES.10 WHAT ARE THE ALTERNATIVE INVENTORY CORRIDORS?

The Alternative Inventory Corridors are the areas in which detailed field investigations were undertaken to identify the socioeconomic, natural, and cultural resources in the study area. The Alternative Inventory Corridors extend 400 feet or greater on either side of the centerline of each alternative carried forward for evaluation. At interchange locations and side streets, the inventory corridor was increased to accommodate potential connections.

Additional inventory data may be needed prior to the ROD to identify avoidance and minimization opportunities for the Preferred Alternative. Additional field investigations also may be required should alignment shifts or design modifications fall outside the current Alternative Inventory Corridor boundaries.

ES.11 WHAT IS THE PLANNING LEVEL LIMIT OF DISTURBANCE?

The illustrative planning level limit of disturbance (LOD) has been developed based on the horizontal alignment, vertical profile, and typical sections for each of the alternatives carried forward for evaluation. The LOD was developed for each alternative using the recommended roadway design criteria and includes drainage and stormwater needs. The LOD is based on a typical roadway section applied along the length of the alignment. Generally, the typical section is a divided highway with 168-foot minimum right of way width that includes a 40-foot wide median, with 40 feet of pavement on each side. The paved section in each direction consists of a four-foot wide inside shoulder, two 12-foot travel lanes, and a 12-foot wide outside shoulder. Beyond the outside shoulders is a buffer space needed for a design speed of 60 mph. Where reconstruction of portions of existing Route 220 would occur under each alternative carried forward for detailed study, an approximately 275-foot wide typical section would be implemented. This additional width would accommodate two 30-foot wide frontage roads that are assumed along both the northbound and southbound lanes with a buffer space in between. The LOD assumes the worst-case scenario for the calculation of impacts and costs within each Alternative Inventory Corridor.

ES.12 WHAT ARE THE ENVIRONMENTAL CONSEQUENCES?

Socioeconomic, natural, and historic resources have been identified within each Alternative Inventory Corridor and impacts have been assessed within the respective planning level LOD for each alternative. Additional geographic boundaries have been evaluated in consideration of historic properties (see **Section 3.4**) and potential indirect effects and cumulative impacts (see **Section 3.13**). The environmental conditions evaluated and their relevance to the alternatives studied in this Draft EIS are summarized in **Table ES-1**.

Potential impacts to these resources are discussed in detail in **Chapter 3: Affected Environment and Environmental Consequences** of this Draft EIS. Additional engineering could occur as part of the Final EIS and permit application in an effort to reduce impacts to socioeconomic, natural, and historic resources.

Table ES-1: Summary of Environmental Issues

Resource	Resource Summary
Community and Community Facilities	Potential impacts to existing communities and community facilities are expected to be minimal. Portions of community facility properties may be impacted, but no relocations would be required. Impacts to the use and functionality of these impacted community facilities would be coordinated. While the new roadway associated with the Build Alternatives would be grade separated from the existing roadways it intersects, allowing for local traffic to flow unimpeded, the new roadway may create a physical barrier between areas that were formerly adjacent to one another. The physical barrier of the roadway may result in a loss of community cohesion and affect communities proximate to the new roadway through the introduction of a new noise source and visual intrusions. However, by providing a new alignment for regional truck traffic and decreasing the mainline traffic volumes on Route 220, local travelers would benefit from improved access to schools and other community facilities, through reduced delay times, additionally allowing for communities to connect to local destinations and other neighborhoods, enhancing community cohesion (see **Section 3.2.1**).
Population and Housing	In order to implement any of the Build Alternatives, right of way acquisition from residential properties would be required, with the potential to require relocations. All affected property owners would be compensated for the fair market value of the acquired portion of land and any structures acquired based on VDOT's Right of Way Manual of Instructions and in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act* of 1970 (as amended). Additionally, property owners would be able to consult VDOT's *A Guide for Property Owners and Tenants*, an information packet for property owners which provides information on VDOT's process of acquiring right of way for public improvement projects (see **Section 3.2.2**).
Economic Resources	Employment within the study area is largely dependent on manufacturing and retail trade. Route 220 provides access to the top employers in Henry County, including the top four largest employers. The Build Alternatives would not impact any commercial properties but could result in industrial property impacts or potential relocations. Any industrial facility displaced as a result of the acquisition of real property would receive reimbursement for the fair market value of property acquired in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act* of 1970 (as amended). Additionally, the owners of the displaced properties would be provided relocation assistance advisory services and would be eligible to receive reimbursement for moving costs. Additionally, property owners would be able to consult VDOT's *A Guide for Property Owners and Tenants*, an information packet for property owners which provides information on VDOT's process of acquiring rights of way for public improvement projects (see **Section 3.2.3**).

Resource	Resource Summary
Land Use	A majority of the study area is comprised of undeveloped (including water bodies) and residential land use. The conversion to transportation use would be relatively small when compared to the existing total acreage per land use class in the study area. Coordination occurred during the development of this Draft EIS for consistency with land use; however, the responsibility for land use planning lies with the local jurisdictions, such that jurisdictions manage zoning changes to accommodate local and regional goals and future zoning plans. Although the localities anticipate the future land use changes, additional coordination with local jurisdictions that manage zoning changes to mitigate extensive impacts to land use would be continued and addressed during final design. Mitigation measures to land use would be coordinated with localities, as necessary (see **Section 3.2.4**).
Environmental Justice	Minority populations have been identified within the block groups containing the Alternatives LODs (Census Tract 106.01 Block Group 1 and Census Tract 107 Block Group 2). Additionally, potential relocations have been identified in the minority block groups, however, any adverse or beneficial effects, including potential relocations, would be felt by all residents, including minority populations, and thus, would not result in a disproportionate high and adverse impact to Environmental Justice populations. No census block groups within the study area have a median household income below the Health and Human Services (HHS) Poverty threshold. All affected property owners would be compensated for the fair market value of the acquired portion of land and any structures acquired based on VDOT's Right of Way Manual of Instructions and in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act* of 1970 (as amended). Relocation resources would be made available without discrimination. VDOT's relocation policies provide an added benefit to low-income displaced persons (although no Census blocks were identified with a median household income lower than the poverty guidelines, individual property owners may qualify as low-income displaced persons). Additionally, public outreach and meaningful access to public information would continue to be provided to minority and/or low-income populations and property owners would be able to consult VDOT's *A Guide for Property Owners and Tenants* (see **Section 3.3**).
Historic Resources	Historic architectural and archaeological surveys have been conducted to identify resources that meet the criteria for the National Register of Historic Places (NRHP) eligibility and that could potentially be affected by the Build Alternatives. No previously identified archaeological sites have been documented within the direct effects Area of Potential Effect (APE) for the Build Alternatives. There are five architectural resources within the APEs associated with the Build Alternatives either already listed on the NRHP or eligible for listing on the NRHP. The State Historic Preservation Office (SHPO) provided concurrence with the eligibility determination for the architectural resources in October 2019. Once the public has had an opportunity to review and comment on the identification of the Preferred Alternative in the Draft EIS, VDOT and FHWA would assess the effects of the Build Alternatives on architectural historic properties and coordinate the findings with the SHPO and other Section 106 consulting parties to determine appropriate measures that would avoid, minimize, or mitigate the adverse effects (see **Section 3.4**).
Wetlands and Streams	Wetlands and streams have been identified within the study area within the Marrowbone Creek and Matrimony Creek watersheds. The wetland and stream impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. The Build Alternatives all impact the most wetlands and streams south of Route 687 (Soapstone Road). Impacts to wetlands and streams could be further avoided and minimized to the maximum extent practicable as part of the Section 404/401 permitting process. Compensatory mitigation for permanent impacts to streams and wetlands would be developed, as required, during the Section 404/401 permitting process in coordination with the appropriate state and Federal agencies (see **Section 3.5.1.2**).

Resource	Resource Summary
Water Quality	The Virginia Department of Environmental Quality (VDEQ) has identified the first 4.5 river miles of Marrowbone Creek as not meeting Virginia's water quality standard for "Recreational Use," due to high levels of bacteria (E. coli). Therefore, VDEQ has included Marrowbone Creek on Virginia's 2018 303(d) list for bacterial impairment. The potential for degradation of water quality resulting from increased pollutant runoff associated with the Build Alternatives would be minimized by the implementation of temporary and permanent stormwater management measures identified in the VDOT's most recent *Road and Bridge Specifications Manual* (VDOT, 2016) (see **Section 3.5.1.1**).
Floodplains	Floodplain mapping indicates the presence of 100-year floodplain in the Alternative Inventory Corridors. Should any improvements advance from the study to further design phases, detailed avoidance and minimization measures would be developed to ensure that no substantial changes to these floodplains occur and potential flooding hazards are diminished, ensuring that the goals of EO 11998 and FHWA policy as set forth in 23 CFR §650 would be met. Federal regulations and VDOT roadway design standards would minimize potential effects to floodplains (see **Section 3.5.2**).
Groundwater Resources	All the Build Alternatives are outside of 1,000-foot wellhead protection radii and are not in sole source aquifers. Therefore, no impacts to public or private groundwater supply wells are anticipated. During more detailed phases of project development, all private wells located in the right of way would be identified, and measures for their protection from contamination would be implemented in accordance with VDOT's *Road and Bridge Specifications* (VDOT, 2016) (see **Section 3.5.3**).
Wildlife Habitat	No Essential Fish Habitat is located within the Alternative Inventory Corridors, the Alternative Inventory Corridors are not used by anadromous fish, and there are no natural or stocked trout streams within the study area. Additionally, no invasive species were observed during field investigations and no natural heritage areas or conservation sites are located within the Alternative Inventory Corridors. The clearing of land associated with the development of the Build Alternatives would impact wildlife and include the displacement of habitat. With the incorporation of best management practices, potential impacts to wildlife and habitat would be avoided to the greatest extent possible (see **Section 3.5.4**).
Threatened and Endangered Species	A total of five potential, threatened and endangered species were identified and require evaluation for this study. No bald eagle nest sites were identified within or near the Alternative Inventory Corridors. In a response to VDOT's scoping letter, dated April 27, 2018, Virginia Department of Conservation and Recreation, Division of Natural Heritage (VDCR-DNH) stated that the Build Alternatives would not affect any documented state-listed plant or insect species. The Northern Long-Eared Bat may be affected by the Build Alternatives; however, any take that may occur would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 Programmatic Biological Opinion for Final 4(d) Rule on the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions. Further coordination with agencies and final effect determinations would be conducted as a part of the Clean Water Act Section 401/404 permitting process (see **Section 3.5.5**).

Resource	Resource Summary
Farmlands	Statewide data provided by Virginia Department of Forestry indicates there are no agricultural or forest districts within the Alternative Inventory Corridors. According to NRCS Web Soil Survey, there are 11 Prime and farmland of statewide importance soil series or named complexes within the Alternative Inventory Corridors that are subject to FPPA compliance. USDA NRCS Farmland Conversion Impact Rating forms have been completed and reviewed by USDA to determine the impact ratings to prime farmland soils and farmland soils of statewide and local importance. Per the FPPA, if USDA NRCS determines that the Build Alternatives have a Farmland Conversion Impact Rating exceeding a total score of 160, then additional mitigative actions may be required; however, none of the Build Alternatives were determined to have a total score exceeding 160; therefore, no further action is recommended to mitigate farmland conversion (see **Section 3.5.6**).
Soils, Mineral Resources, and Unique Geology	Physical properties of soils within the study area influence the evaluation of the alternatives as they relate to the stability of slopes as well as potential impacts caused by erosion, sedimentation, soil/ground settlement, subsidence, and the potential for wetlands. All of the Build Alternatives traverse the Ridgeway fault. Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later stages of project development (see **Section 3.5.7**).
Air Quality	Changes in existing carbon monoxide (CO), particulate matter (PM) and mobile source air toxics (MSATs), have been analyzed, in addition to potential construction emissions. As a result of these analyses, no adverse impacts to ambient air quality or human health and welfare are anticipated. In addition, the Build Alternatives are not expected to cause or contribute to any violations of the National Ambient Air Quality Standards and MSAT emissions from the affected network would be significantly lower than they are today (see **Section 3.6**).
Noise	The noise analysis indicates that there are noise sensitive receptors (predominantly residential) that have the potential to be impacted under each Build Alternative. Specific noise abatement measures would be determined during more detailed phases of project development (see **Section 3.7**).
Hazardous Materials	A search of Federal and state agency databases identified and mapped 49 sites with 85 hazardous materials regulatory database listings within the one-half-mile search area of the Inventory Corridors and identified 14 orphaned sites with 17 regulatory database listings that were unmappable because of insufficient address information. No visual evidence of ongoing corrective action, remediation or additional recognized environmental conditions (REC) were observed during field verification and visual reconnaissance of the mappable, unmappable, and field-verified sites. Further evaluation of sites associated with the Preferred Alternative with identified potential RECs is recommended prior to right of way acquisition and/or earth disturbing activities to provide additional information about site conditions in order to determine potential mitigation or remediation measures (see **Section 3.8**).
Visual Resources	Aesthetic and visual resources are perceived landscape features that contribute to the overall quality and public enjoyment of the environment. Visual quality within the study area and potential impacts from the Build Alternatives were determined by assessing the change in visual resources due to the alternatives and predicting viewer response to that change, with magnitudes of minor, moderate, or major. Measures to minimize or mitigate visual quality effects often include landscaping and modifications to enhance the aesthetics of topography, structure, and lighting design. Should the study advances to more detailed phases of development, VDOT would consider approaches that would address concerns of highly sensitive viewsheds (see **Section 3.9**).

Resource	Resource Summary
Energy	For all Build Alternatives, construction energy would be used to build the mainline roadway, interchanges, structures, and bridges. Because construction is a one-time occurrence and temporary, no long-term impacts to energy consumption would occur. All Build Alternatives would provide a new roadway with the potential for increased capacity and increased fuel consumption. However, this would be offset by reducing vehicle idling and stop-and-go conditions on Route 220 – thereby reducing energy consumption from the existing condition (see **Section 3.10**).
Children's Health and Safety	Assessment of children's health has been performed in accordance with EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which directs Federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children. The most likely issues would be impacts to schools and the study area's air quality and noise impacts; however, none of the Build Alternatives would pose health or safety concerns that would disproportionately affect children (see **Section 3.11**).
Short and Long-Term Construction Effects	The short-term impacts and uses of resources from the Build Alternatives are not expected to detract from the enhancement of long-term productivity and transportation benefits for the local area, region, and Commonwealth of Virginia as a whole. Additionally, compared to the anticipated benefits resulting from the Build Alternatives, the long-term losses are expected to be commensurate (see **Section 3.12**).
Indirect and Cumulative Effects	Incremental effects of the alternatives contributing to cumulative socioeconomic, natural, and historic resources would range from minor beneficial to major adverse. Coupled with past, present, and future actions, the overall cumulative effects of the Build Alternatives would range from beneficial to adverse to socioeconomic resources, adverse to natural resources, and none to adverse to historic resources (see **Section 3.13**).

ES.13 WHAT IS THE ESTIMATED COST FOR EACH ALTERNATIVE?

The estimated construction cost for each of the Build Alternatives retained for evaluation are shown in **Table ES-2**. The total costs range from $615,910,000 to $757,340,000. More detailed cost information can be found in the ***Alternatives Analysis Technical Report*** (VDOT, 2020b).

Table ES-2: Total Estimated Costs

Cost	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Construction and Preliminary Engineering	$737,220,000	$713,020,000	$584,550,000
Right of way	$16,970,000	$29,860,000	$28,980,000
Utilities	$3,150,000	$2,970,000	$2,380,000
Total Estimated Cost	**$757,340,000**	**$745,840,000**	**$615,910,000**

Note: Shaded column denotes Preferred Alternative.

ES.14 WHAT IS THE PREFERRED ALTERNATIVE?

Alternative C has been identified as the Preferred Alternative for the Martinsville Southern Connector Study. Alternative C satisfies the Purpose and Need, and best balances impacts to resources and cost. In addition, Alternative C has been identified as the preliminary Least Environmentally-Damaging Preferred Alternative (LEDPA) based on concurrence from USACE and EPA. USACE can only provide permit authorization of the LEDPA. Although USACE's formal identification of the LEDPA is a determination made as part of a permit decision, the preliminary determination that the Preferred Alternative appears to be the LEDPA will allow the study to advance to the permitting stage in the Final EIS. Permit authorization is anticipated to occur under the OFD for the Martinsville Southern Connector Study.

ES.15 WHAT PUBLIC OUTREACH EFFORTS HAVE BEEN UNDERTAKEN?

The development of this Draft EIS has been informed by extensive and strategic public outreach. Public involvement opportunities helped ensure that citizens, interest groups, civic organizations, and businesses had adequate opportunities to express their views throughout the environmental review process. Various communication methods, including print, website, email, and social media, were used to provide information about the study and gather input from citizens and other interested parties.

VDOT's public outreach activities throughout the development of this Draft EIS have included website updates, emails, monthly newsletters, property owner mailings, online surveys, and social media advertisements, to ensure transparency in the environmental review process and to allow the public to provide input on important decision points during the study. The following outlines the major public involvement milestones during the development of this Draft EIS:

- In May 2018, a Citizen Information Meeting (CIM) was held to introduce the public to the Martinsville Southern Connector Study and to gather public feedback on issues to be addressed and any concerns related to resources that may need to be considered within the study area. The meeting was attended by 11 members of the public and 13 comments were submitted either through mail, email, or at the meeting.
- Between September and October 2018, VDOT initiated its distribution of monthly newsletters distributed to the study email list. Interested individuals are still able to visit the study web site and sign up for this mailing list. At the same time, an online survey was conducted to solicit input on the study's Purpose and Need; a total of 775 survey responses were received on transportation issues regarding Route 220.
- In January 2019, a CIM was conducted to provide information to the public regarding study goals and the alignment options under consideration. Comments received included 50 from online commenters and 30 by those who attended the CIM.
- In February 2019, VDOT introduced the Martinsville Southern Connector Study to the Commonwealth Transportation Board (CTB). As with all CTB meetings, this workshop was open to the public and included focused discussion on the OFD process related to the study.
- In March 2019, an additional online survey was conducted to collect data on the potential effect that bi-annual race events at the Martinsville Speedway had on traffic along existing Route 220. Social media was used to promote the survey and to connect individuals with the study website. A total of 200 respondents participated in the survey.
- In May 2019, VDOT provided an update to the CTB on the progress of the study, outlining the upcoming schedule and VDOT's intent to request an action from the CTB at future upcoming meetings, following receipt of concurrence from USACE and EPA on the Preferred Alternative.
- In August 2019, a Location Public Hearing was held to solicit public feedback on VDOT's recommendation of a Preferred Alternative. A total of 659 comments were received at the meeting or submitted online, in the mail, or through email during the comment period.
- In December 2019, the Preferred Alternative was presented to the CTB and the CTB approved the location of Alternative C during their January 2020 meeting.
- In March 2020, a Public Hearing is scheduled to present the findings and results of this Draft EIS and solicit public input.

Public involvement and outreach activities are discussed in detail in **Section 6.3** of this Draft EIS.

ES.16 WHAT ADDITIONAL PUBLIC OUTREACH OPPORTUNITIES WILL THERE BE?

Information sharing and outreach via newsletters, website updates, press releases social media and other public outreach methods are expected to continue until early 2021 when FHWA's ROD and USACE's permit decision, as well as permits from state regulatory agencies, are anticipated. Through the remainder of the environmental review process, VDOT anticipates the following formal opportunities for public involvement in the study process.

- Public Comment Period on Draft EIS – March 6, 2020 until April 20, 2020
- Public Hearing on Draft EIS – March 26, 2020
- USACE Public Notice on Joint Permit Application – Mid 2020
- VDEQ Public Notice on Draft Permit Issuance – Mid to Late 2020
- Public Availability of the Final EIS – Late 2020

ES.17 HOW CAN THE PUBLIC COMMENT ON THE DRAFT EIS?

Consistent with FHWA's regulations for implementing NEPA [23 CFR §771.123(i)], comments on the Draft EIS can be submitted on or before TBD. The public comment period for the Draft EIS is for a period of 45 days from the notice of availability, posted on the Federal Register and VDOT's website. The public, interested stakeholders, and agencies are invited to provide their input to VDOT electronically using the comment form, email contact, or mailing address found on the study website (www.virginiadot.org/martinsvilleconnector). Comments may also be submitted in writing or by verbal testimony at the Public Hearing, which is scheduled for March 26, 2020.

ES.18 ARE THERE ANY UNRESOLVED ISSUES ASSOCIATED WITH THE STUDY? WHAT IS THE APPROACH TO RESOLVE THESE ISSUES AND WHAT ARE THE NEXT STEPS?

There are no unresolved issues regarding the Draft EIS; however, there are a number of steps that would need to be accomplished prior to the completion of the Martinsville Southern Connector Study and prior to implementation of any improvements that advance from the study. Following an opportunity for the public to review and provide comments on the Draft EIS, FHWA and VDOT will work with the Cooperating and Participating Agencies to determine if additional refinements to the Preferred Alternative should be incorporated into the Final EIS and permit applications. As part of the OFD process, the following steps are anticipated to complete the synchronized Federal environmental review process and allow VDOT to advance with more detailed design and procurement activities when funding is available.

Section 404 Joint Permit Application Completeness Determination – Mid 2020

- Official Notice of Availability of a Final EIS published in the Federal Register – Late 2020
- FHWA Issuance of a ROD[3] – Early 2021
- Section 404 Final Verification/Permit Decision Rendered – Early 2021

[3] Funding for a subsequent phase of the project development process will be identified prior to FHWA's issuance of a ROD.

Table ES-3 provides a summary of permit approvals and consultation requirements, including the Federal milestones outlined above as part of the OFD process, that are required as part of the NEPA process or prior to the commencement of construction activities for any improvements that advance from the Martinsville Southern Connector Study.

Table ES-3: Federal, State, and Local Permit Approvals and Consultation Requirements

Permit/Action	Authorizing Regulation	Regulatory Agency	Agency Action
Final EIS	National Environmental Policy Act	FHWA	Approval of the Final EIS, which will discuss substantive comments on the Draft EIS and identify and describe the Preferred Alternative, including any refinements or additional analyses in consideration of comments received.
Record of Decision	National Environmental Policy Act	FHWA	Issuance of a ROD, which identifies the selected alternative, presents the basis for the decision to select that alternative, documents all of the alternatives considered, and summarizes any mitigation measures that would be incorporated as part of the implementation of any selected improvements.
Section 4(f) Approval	Section 4(f), U.S. Department of Transportation Act	FHWA	Determination that there are no prudent and feasible avoidance alternatives and that all possible planning has been done to minimize harm resulting from the use of any public parks and recreation lands, wildlife and waterfowl refuges, and historic sites; unless a determination is made that the use will have a *de minimis* impact on the property.
Programmatic Agreement	Section 106, National Historic Preservation Act	SHPO	FHWA and VDOT will consult with the SHPO and other parties to the Section 106 process to determine appropriate measures that would avoid, minimize, or mitigate any adverse effects to historic resources.
Section 404 Dredge and Fill Permit	Section 404, Clean Water Act	USACE	Authorization for activities that result in the discharge of dredged materials or fill into waters of the U.S., including wetlands.
Virginia Water Protection Permit	Section 404, Clean Water Act Code of Virginia, Chapter 3.1, Title 62.1	VDEQ	Authorization for impacts to surface waters, including wetlands.
Subaqueous Bed Permit	Code of Virginia, Section 28.2-1203	Virginia Marine Resources Commission (VMRC)	Authorization for encroachment on beds of the bays, rivers, creeks.
Section 401 Water Quality Permit	Section 401, Clean Water Act	VDEQ	Certification that prospective permits comply with the state's applicable effluent limitations and water quality standards.

Permit/Action	Authorizing Regulation	Regulatory Agency	Agency Action
Virginia Pollutant Discharge Elimination System (VPDES) Construction General Permit	Section 402, Clean Water Act	VDEQ	Authorization for discharges during construction and stormwater management plans.
Endangered Species Act Consultation	Endangered Species Act	USFWS	Determination of effect to protected threatened and endangered species.

TABLE OF CONTENTS

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ACRONYMS

AADT	Average Annual Daily Traffic
AASHO	American Association of State Highway Officials
AASHTO	American Association of State Highway Transportation Officials
ACHP	Advisory Council on Historic Preservation
ACS	American Community Survey
ADT	Average Daily Traffic
APE	Area of Potential Effects
APP	Arterial Preservation Program
ASTM	American Society for Testing and Materials
AVE	Area of Visual Effect
BMPs	Best Management Practices
CAFÉ	Corporate Average Fuel Economy
CCB	Center for Conservation Biology
CEDAR	Comprehensive Environmental Data and Reporting
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CIM	Citizen Information Meeting
CLOMR	Conditional Letters of Map Revision
CNE	Common Noise Environment
CO	Carbon Monoxide
CoSS	Corridor of Statewide Significance
COV	Code of Virginia
CTB	Commonwealth Transportation Board
CWA	Clean Water Act
dB(A)	A-weighted decibels
DRBA	Dan River Basin Association
EDC	Economic Development Corporation
EFH	Essential Fish Habitat
EIA	US Energy Information Administration
EIS	Environmental Impact Statement
EJ	Environmental Justice
EJSCREEN	EPA Environmental Justice Screening and Mapping Tool
EO	Executive Order
Envirosite	Envirosite Corporation
EPA	United States Environmental Protection Agency
ESA	Environmental Site Assessment
ESC	Erosion and Sediment Controls
FCIR	Farmland Conversion Impact Rating
FEMA	Federal Emergency Management Agency
FHWA	Federal Highway Administration
FPPA	Farmland Protection Policy Act

FY	Fiscal Year
GHG	Greenhouse gas
GIS	Geographic Information System
GWMA	Groundwater Management Areas
HCPC	Henry County Planning Commission
HHS	Health and Human Services
HUC	Hydrologic Unit Code
ICE	Indirect and Cumulative Effects
IPaC	Information for Planning and Consultation
ITS	Intelligent Transportation Systems
JPA	Joint Permit Application
LEDPA	Least Environmentally-Damaging Practicable Alternative
L_{eq}	Equivalent sound level
LDV	Light duty vehicles
LF	Linear feet
LOD	Illustrative Planning Level Limits of Disturbance
LOMR	Letters of Map Revision
LOS	Level of Service
LPT	Leaking Petroleum Storage Tank
LRTP	Long Range Transportation Plan
LWCF	Land and Water Conservation Fund
MOVES	Motor Vehicle Emissions Simulator
MPG	Miles per gallon
MPH	Miles per hour
MRDS	Mineral Resources Data System
MSAT	Mobile Source Air Toxics
NAAQS	National Ambient Air Quality Standards
NAC	Noise Abatement Criteria
NCDOT	North Carolina Department of Transportation
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NFIP	National Flood Insurance Program
NFRAP	No Further Remedial Action Planned
NHD	National Hydrography Dataset
NHDE	Natural Heritage Data Explorer
NHPA	National Historic Preservation Act
NHS	National Highway System
NLCD	National Land Cover Database
NLEB	Northern long-eared bat
NMFS	National Marine Fisheries Service
NMS	Noise Monitoring Site
NOx	Nitrogen Oxides
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service
NRHP	National Register of Historic Places
NTHP	National Trust for Historic Preservation
NWI	National Wetlands Inventory
O3	Ozone
OFD	One Federal Decision

PA	Programmatic Agreement
PART	Piedmont Area Regional Transit
PCES	Project Cost Estimating System
PEM	Palustrine Emergent
PFO	Palustrine Forested
PM	Particulate Matter
POW	Palustrine Open Water
PSS	Palustrine Scrub-Shrub
PTI	Piedmont Triad International Airport
PUB	Palustrine Unconsolidated Bottom
RECs	Recognized Environmental Conditions
RCUT	Restricted cross-street u-turn
RCRA-SQG	Resource Conservation and Recovery Act Small Quantity Generator
ROD	Record of Decision
RMP	Remedial Management Plan
SDWA	Safe Water Drinking Act
SHPO	State Historic Preservation Officer
SPCC	Spill Prevention Control and Countermeasure
SSA	Sole Source Aquifer
SVOC	Semivolatile Organic Compound
SWM	Stormwater Management
SWPP	Stormwater Protection Program
SYIP	Six-Year Improvement Program
TDM	Transportation Demand Management
TEA-21	Transportation Equity Act for the 21st Century
TMDL	Total Maximum Daily Load
TNM	Traffic Noise Model
TOYR	Time of Year Restriction
TRB	Transportation Research Board
TSM	Transportation System Management
USC	United States Code
USDA	United States Department of Agriculture
USACE	United States Army Corps of Engineers
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
USM	Unified Stream Methodology
UST	Underground Storage Tank
VAC	Virginia Administrative Code
VaFWIS	Virginia Fish and Wildlife Information Service
VaNLA	Virginia Natural Landscape Assessment
VARTF	Virginia Aquatic Resources Trust Fund
V-CRIS	Virginia Cultural Resource Information System
VDACS	Virginia Department of Agriculture and Consumer Services
VDCR	Virginia Department of Conservation and Recreation
VDCR-DNH	Virginia Department of Conservation and Recreation–Division of Natural Heritage
VDEQ	Virginia Department of Environmental Quality
VDGIF	Virginia Department of Game and Inland Fisheries
VDH	Virginia Department of Health
VDHCD	Virginia Department of Housing and Community Development
VDHR	Virginia Department of Historic Resources

VDOT	Virginia Department of Transportation
VEC	Virginia Employment Commission
VEGIS	Virginia Environmental Geographic Information Systems
VGIN	Virginia Geographic Information Network
VMRC	Virginia Marine Resources Commission
VMT	Vehicle Miles Travelled
VOC	Volatile Organic Carbon
VPDES	Virginia Pollutant Discharge Elimination System
VSMP	Virginia Stormwater Management Program
VWPP	Virginia Water Protection Permit
WERMS	Wildlife Environmental Review Map Service
WOUS	Waters of the United States
WPP	Wellhead Protection Program
WPPDC	West Piedmont Planning District Commission

CHAPTER 1

Purpose & Need

1. PURPOSE AND NEED

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the Federal Lead Agency and in cooperation with the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA), have prepared this Draft Environmental Impact Statement (EIS) for the Martinsville Southern Connector Study – Route 220 EIS (Martinsville Southern Connector Study). This study evaluates potential transportation improvements along the U.S. Route 220 (Route 220) corridor between the North Carolina state line and U.S. Route 58 (Route 58) in Henry County near the City of Martinsville (Martinsville), Virginia.

This Draft EIS has been prepared pursuant to the National Environmental Policy Act of 1969 (NEPA), codified in 42 USC §4321-4347, as amended, and in accordance with FHWA regulations, found in 23 CFR §771. As part of this Draft EIS, the environmental review process has been carried out following the conditions and understanding of the *NEPA and Clean Water Act (Section 404) Merged Process for Highway Projects in Virginia* (merged process)[4].

The Martinsville Southern Connector Study also follows the One Federal Decision (OFD) process, which was enacted on August 15, 2017 by Executive Order (EO) 13807: *Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects* (82 FR 163). EO 13807 implements a policy for Federal Lead Agencies of major infrastructure projects to coordinate among any Cooperating or Participating Agencies involved in the NEPA review process to memorialize their findings, determinations, or approvals in synchronized Record of Decision (ROD) documents; this process is commonly referred to as OFD. Major infrastructure projects are defined by EO 13807 as projects for which multiple authorizations by Federal agencies would be required to proceed with construction, the Federal Lead Agency has determined that it will prepare an EIS under NEPA, and the project sponsor has identified the reasonable availability of funds sufficient to complete the project (82 FR 163, p. 40464). As part of OFD, specific timelines and milestones, such as permitting decisions under the Clean Water Act of 1972 (CWA) (33 USC §1251 et seq.), are established for the environmental review and authorization schedule, to ensure accountability and efficiency among all Federal agencies involved in the development and approval of major infrastructure projects. After receiving OFD designation by FHWA in the Fall of 2018, the Martinsville Southern Connector Study is following the process and coordination schedule outlined on the Federal Dashboard for Federal Infrastructure Projects[5].

This chapter describes the Purpose and Need statement for the Martinsville Southern Connector Study. The purpose element of the statement explains the problem that the improvements evaluated in this Draft EIS are intended to address. The need element includes the data substantiating that a problem currently exists or is likely to occur. In order to establish the context and an understanding for the elements of need identified in this study, this chapter also discusses the study area, the functions of Route 220 and other roadways in the study area, the history of

[4] Established under a memorandum of understanding between VDOT, FHWA, USACE, EPA, and the U.S. Fish and Wildlife Service (USFWS), the merged process establishes a procedure for coordinated environmental review and development of documentation in Virginia that complies with the requirements of NEPA and provides sufficient information to support Federal regulatory decision-making, including FHWA approval or permits issued by other Federal agencies.

[5] The Martinsville Southern Connector Study is following the OFD process, subsequent to receiving OFD designation by FHWA. OFD requires that major infrastructure projects have a single permitting timetable for synchronized environmental reviews and authorizations: www.permits.performance.gov/permitting-projects/us-route-58220-bypass-north-carolina-state-line-limited-access-study.

Route 220, and related studies of the corridor. For each identified need element, the existing conditions and anticipated future conditions are detailed as well as other factors to be considered in the study.

1.1 STUDY AREA AND EXISTING CONDITIONS

1.1.1 Study Area

The study area for the Martinsville Southern Connector Study is located south of Martinsville in Henry County, Virginia. Positioned on the southern border of Virginia, the study area is located approximately 60 miles southeast of the City of Roanoke (Roanoke) via Route 220, 30 miles west of the City of Danville via Route 58, and 40 miles north of the City of Greensboro (Greensboro) in North Carolina via Interstate 73 and Route 220.

The study area encompasses approximately seven miles of the Route 220 corridor, between the interchange of Route 220 with the William F. Stone Highway and the North Carolina state line. Within the study area, existing Route 220 consists of a four-lane roadway, with two travel lanes in each direction. The William F. Stone Highway is signed as Route 58 to the east of its interchange with Route 220; west of the interchange, Route 220 is collocated with Route 58 as both bypass Martinsville. For the purposes of consistency in this study, portions of the William F. Stone Highway east and west of the Route 220 interchange are herein referred to as Route 58. The study area also includes the interchange of Route 58 at Route 641 (Joseph Martin Highway), approximately 1.25 miles west of Route 220. Additionally, the study area encompasses the Town of Ridgeway (Ridgeway), where Route 220 connects with Route 87 (Morehead Avenue), approximately three miles south of Route 58.

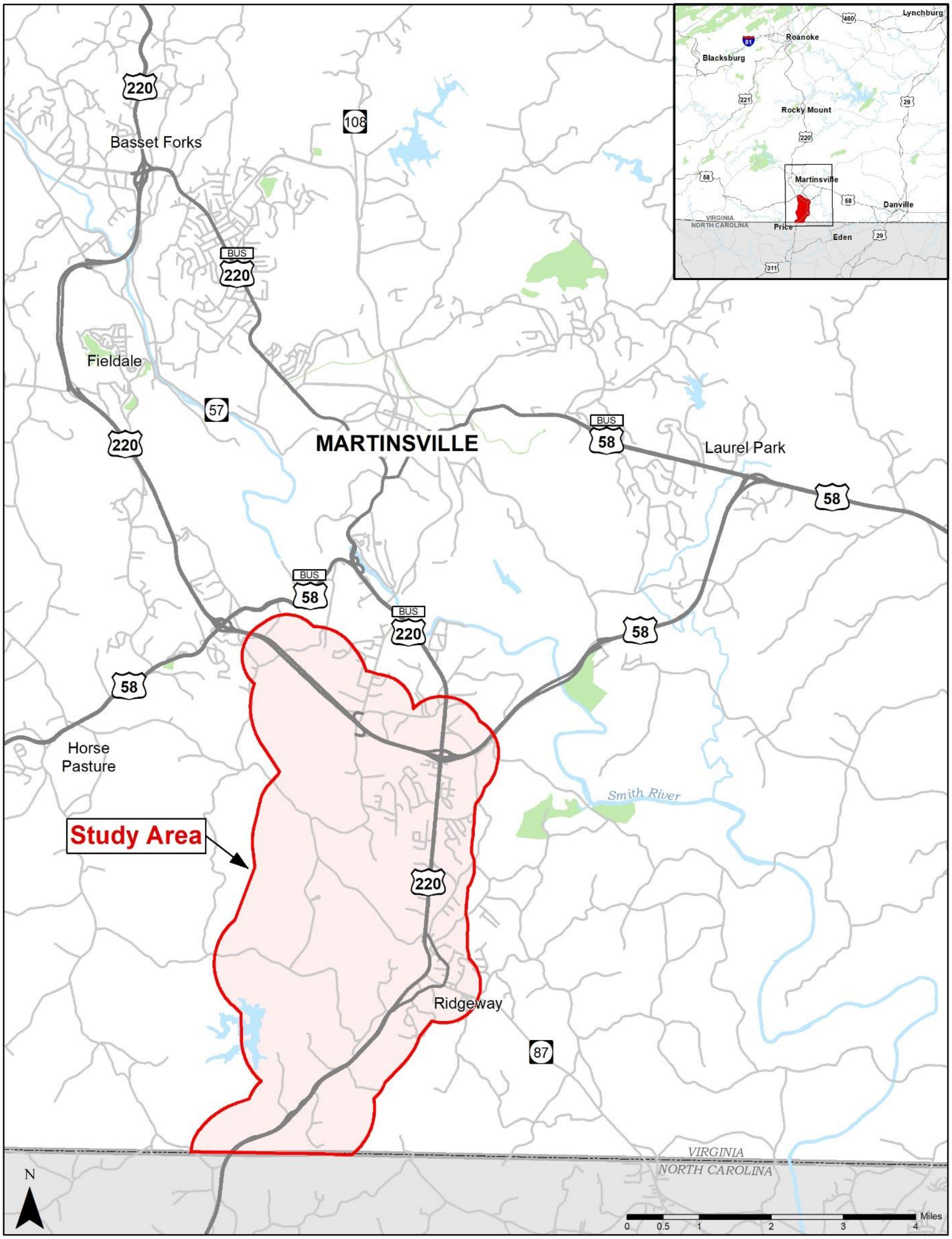
The study area is characterized by areas of rolling topography in the foothills of the Piedmont Physiographic Province, just east of the Blue Ridge Mountains. Topography in the study area generally ranges from approximately 700 to 1,200 feet above sea level. Land use within the study area generally consists of undeveloped forest and agricultural lands, with rural residential lots scattered throughout. Along existing Route 220, from the North Carolina state line towards Martinsville, land use includes commercial development that is increasingly more dense, compared to the rest of the study area.

The study area boundary for the Martinsville Southern Connector Study has been developed to assist with data collection efforts and the evaluation of the alternatives retained for evaluation presented in **Chapter 2: Alternatives** of this Draft EIS. The study area boundary, illustrated on **Figure 1-1**, generally includes an area of approximately one-half mile outside the planning level limit of disturbance (LOD)[6] for each alternative retained for evaluation.

Within the study area, Route 220 connects Martinsville and North Carolina; beyond the study area boundary, Route 220 connects the metropolitan areas of Roanoke to the north and Greensboro to the south. Route 220 is a primary transportation corridor connecting these more urban areas and is a primary north-south freight route. Route 220 also provides direct access to businesses, homes, schools, and recreational opportunities throughout Henry County and Ridgeway.

[6] The illustrative planning level LOD has been developed based on the horizontal alignment, vertical profile, and typical sections for each of the alternatives carried forward for evaluation and discussed in **Chapter 2** of this Draft EIS.

Figure 1-1: Study Area



The *City of Martinsville, Virginia 2009 Comprehensive Plan Update* identifies Route 220 as an asset to the area with respect to trade and commerce (City of Martinsville Planning Commission, 2009). In addition, the *Corridors of Statewide Significance, North Carolina to West Virginia Corridor – U.S. 220* report identified the segment along Route 220 between Ridgeway and the Route 58 interchange to have the highest daily traffic in Henry County (WPPDC, 2013).

1.1.2 Existing Conditions

Route 220 is part of the National Highway System (NHS)[7] and is functionally classified as an other principal arterial within the study area[8]. These types of roadways serve corridor movements of substantial statewide or interstate travel and provide an integrated roadway network between activity and population centers (VDOT, 2014).

Route 220 is designated as a Corridor of Statewide Significance (CoSS) in *VTrans2040*[9], Virginia's statewide multi-modal transportation policy plan (OIPI, 2015). The portion of Route 220 encompassed by the study area is included within the North Carolina to West Virginia CoSS (Segment F1), which is identified by *VTrans 2040* as a primary facility for both local access of travel originating in the Roanoke Valley Area and for regional throughput of passenger vehicles and freight truck traffic. In addition to connecting population centers in the Roanoke Valley Area and serving as a primary north-south freight route, Route 220 connects businesses, homes, schools, and recreational facilities throughout Henry County and Ridgeway. This section of Route 220 was first identified as a part of the Multimodal Investment Network (the predecessor of the CoSS) in the *VTrans 2025* plan (VDOT, 2004). These corridors were identified to receive a focus on statewide investment.

Along Route 220 in the study area, between the North Carolina state line and just south of the Route 58 interchange, there are a total of five signalized intersections, 18 unsignalized median crossovers, and over 100 residential and commercial driveways with direct access to the roadway. The Norfolk Southern railroad parallels Route 220 over much of the southern and central portions of the study area. The Norfolk Southern railroad supports freight rail service between the Cities of Roanoke, Virginia, and Greensboro, North Carolina. Route 220 crosses over the Norfolk Southern railroad on two parallel bridges located north of Ridgeway. As Route 220 crosses Marrowbone Creek, there are two separate bridge structures for northbound and southbound Route 220.

The primary east-west route within the study area is Route 58, which is a four-lane divided highway. Classified as other freeway or expressway, the primary function of Route 58 is to provide service to traffic entering and leaving Martinsville, as well as most of the traffic bypassing the central city.

---

[7] According to FHWA, the NHS includes the Interstate Highway System as well as other roads important to the nation's economy, defense, and mobility (FHWA, 2019c).

[8] According to the Sixth Edition of the American Association of State Highway and Transportation Officials' (AASHTO) *A Policy on Geometric Design of Highways and Streets* (Green Book), functional classification is the process by which highways and streets are grouped into classes (i.e. arterial, collector, local) or systems, according to the character of service that they are intended to provide. Arterial roadways are intended to provide a high level of mobility while providing a low level of access to adjoining properties. In contrast, local roadways are intended to provide a high level of access to adjoining properties while providing a low level of mobility (AASHTO, 2011).

[9] CoSS are those facilities and services in the Commonwealth of Virginia that comprise the multimodal network connecting major centers of activity and accommodate inter-city travel between these centers as well as interstate traffic (OIPI, 2015).

There are entrance gates to the east of the Route 220 interchange along Route 58 that are opened temporarily on race days to provide additional access to the Martinsville Speedway, located approximately one mile northeast of the Route 220 interchange with Route 58. The gates provide travel demand relief for the interchange of Route 58 and Route 220 during events at the Martinsville Speedway. Morehead Avenue and Route 687 (Soapstone Road) are two-lane rural arterial roadways that also carry traffic to the east and west, located towards the center of the study area near Ridgeway. These roads are connected by a signalized intersection with Route 220. Joseph Martin Highway, Route 688 (Lee Ford Camp Road), Route 639 (Phospho Springs Road), Old Leaksville Road, Old Sand Road, and Eggleston Falls Road are other collector and local routes that carry traffic both within and beyond the study area. The local street system permits direct access to abutting lands and connections to freeways, and arterials.

The principal advantages of controlling roadway access are resulting improvements to the movement of vehicles and the reduction of crash frequency and severity (AASHTO, 2011). There are varying degrees of access management, from uncontrolled to full access control via interchanges. The principal advantages of controlling roadway access are resulting improvements to the movement of vehicles and the reduction of crash frequency and severity (AASHTO, 2011). Providing access control on a highway serves to manage the interference with regional through traffic. Access management measures have been implemented on Route 220 (full access control) north of the study area and on Route 220 south and Route 58 east of the study area (partial access control). Since access to adjacent properties is not the primary intent of roadways functionally classified as freeways or expressways, access to Route 58 within the study area occurs via interchanges at Route 220 and Joseph Martin Highway. This access management measure is called full access control[10]. South of the North Carolina state line, partial access control has been implemented on Route 220 from selected public roads and private driveways through at-grade or grade-separated connections.

For the purposes of evaluating transportation improvements along the Route 220 corridor in the study area, full access control was assumed to represent the worst-case scenario for environmental impacts and associated costs. Specific access management options may be determined as the environmental review process advances, which could be documented in the Final EIS and included in any future permit conditions. Since the Commonwealth Transportation Board (CTB) has the authority to regulate limited access highways (§33.2-401 of the Code of Virginia) and the Commonwealth Transportation Commissioner is conferred the power to apply access management standards to preserve the efficient operation of the state highway system (§33.1-198.1 of the Code of Virginia), this determination may also be deferred until a later date when more detailed design advances and if funding for future phases of the project development process should become available. As a result, no commitments related to specific access control measures are made in this Draft EIS.

[10] Regulating access to a roadway is called access control. There are different degrees of access control: full access control, partial access control, and uncontrolled access. Full control of access means that preference is given to regional through traffic by providing access connections at interchanges with only selected public roads and by prohibiting crossings at grade and direct private driveway connections (AASHTO, 2011). Full control of access to Route 58 is provided by means of ramp connections with only selected public roads, providing preference to regional through traffic. Restricting access to other at-grade roadway crossings and adjacent properties functions to preserve the mobility of regional through traffic movements and to manage the interference of vehicles or pedestrians entering, leaving, and crossing Route 58.

Within the study area, Route 220 consists of three distinct segments identified as Segment A, Segment B, and Segment C (see **Figure 1-2**). Each segment has unique traffic and roadway characteristics. The three segments that comprise Route 220 are described below from south to north.

1.1.2.1 Segment A – North Carolina State Line to Ridgeway

Segment A includes the southern section of Route 220 from the North Carolina state line to north of the Lee Ford Camp Road/Church Street intersection, south of Ridgeway. There are no traffic signals through this section; however, there are eight intersecting streets, eight median crossovers, and 44 driveways that connect to the roadway. The posted speed limit is 55 miles per hour (mph). The northernmost intersection in this segment is Lee Ford Camp Road/Church Street, with Church Street providing direct access to Ridgeway. The Norfolk Southern railroad runs parallel to Route 220 on the west side through this segment.

1.1.2.2 Segment B – Area Near Ridgeway

Segment B covers the center of Route 220 in the study area, extending from north of Church Street to north of the Main Street/Soapstone Road intersection near Ridgeway. The only access points to and from Route 220 are at signalized intersections with Morehead Avenue and Main Street/Soapstone Road, and the posted speed limit is 55 mph. The signal at Morehead Avenue is the first traffic signal that northbound drivers traveling on existing Route 220 encounter for 28 miles, as all the major crossroads in North Carolina to Interstate 73 in Greensboro have been replaced with interchanges. North of Morehead Avenue, the Norfolk Southern railroad crosses under Route 220 and continues on the east side of Route 220 through the northern part of the study area.

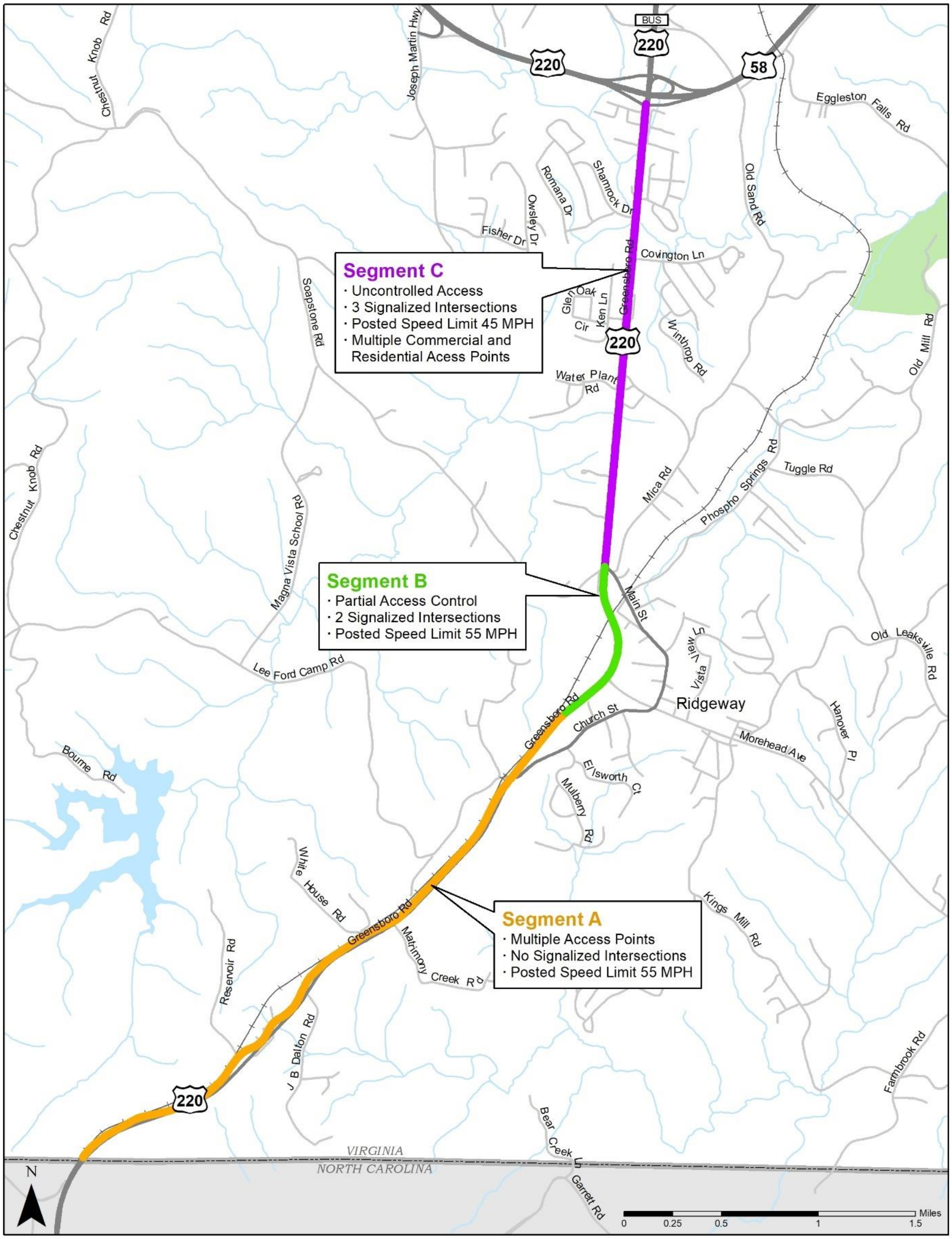
1.1.2.3 Segment C – Ridgeway to Route 58

Segment C includes the northern segment of Route 220, extending from north of Main Street/Soapstone Road, north of Ridgeway, to the interchange with Route 58. This section of Route 220 has a posted speed limit of 45 mph and includes three signalized intersections, nine intersecting side streets, two entrances to the Drewry Mason Elementary School, as well as 55 commercial and residential driveways. Two of the signalized intersections are the on- and off-ramps at the interchange with Route 58 and the other is at Water Plant Road/Mica Road. Access is provided to Route 220 at nine unsignalized side street intersections. The properties in Segment C often have multiple entrances from the roadway and, in some cases, the entire frontage of the property along Route 220 is one large driveway entrance.

1.2 HISTORY OF ROUTE 220 WITHIN THE STUDY AREA

Route 220 was originally constructed as a two-lane roadway in 1926 and signed as Route 311 as part of the establishment of the U.S. Highway System (Virginia Highways Project, 2018b). This original route included the existing southbound roadway below Church Street, then followed Church Street and Main Street through Ridgeway before crossing the Norfolk and Western (now Norfolk Southern) railway tracks at a gated crossing at the current location of the Main Street bridge over the railway. The route then turned northward and followed present-day Mica Road to its current terminus north of the Water Plant Road intersection. At this point, the roadway turned to the north, following the same route as today’s southbound roadway into Martinsville (VDOT, 1926). In October of 1935, the entire route was re-designated as Route 220. In 1954, the grade crossing at Main Street was replaced with a bridge over the railway as part of a two-lane bypass of Mica Road (VDOT Archived Plans, 1953).

Figure 1-2: Route 220 Segments



In 1958, Segment A, the southern part of the study area, was the first section of Route 220 to be widened to four lanes. The widening was accomplished by converting the existing roadway into two southbound lanes and a new roadway was built for northbound traffic with a variable-width median. There were no improvements made to the alignment of the southbound roadway at this time; maintaining the originally constructed curves and abrupt changes in grade (VDOT Archived Plans, 1956). The new northbound roadway was built using the design guidance of the American Association of State Highway Officials (AASHO) from 1954 for rural highways (AASHO, 1954).

Traveling north, the original alignment passed through Ridgeway as Church Street and Main Street until a two-lane bypass (Segment B in this study) with a new two-lane bridge over the railway was completed in 1963 (VDOT Archived Plans, 1962). The northern segment, Segment C, was widened from two lanes with turning lanes to four lanes with a continuous 40-foot median and turning lanes in 1966 (Virginia Highways Project, 2018a). The original roadway became the southbound lanes and a new northbound roadway was constructed to the east (VDOT Archived Plans, 1965). In 1972, Segment B was the last four-lane section to be completed (VDOT Archived Plans, 1970). New lanes for the northbound roadway were built to the east of the existing roadway and the original roadway became the southbound lanes. A new bridge over the Norfolk Southern railway was built adjacent to the existing bridge.

Route 58, which bypasses Martinsville outside of its southern limits, was constructed in two stages. The section of Route 58 west of Route 220 that is currently signed as both Route 58 and Route 220 was the first stage to be completed in 1977 (VDOT Archived Plans, 1969). The interchange at Route 220 was fully graded at this time; however, only the ramps that connected to the bypass to the west were paved. Prior to the interchange being built, both Poplar Street and Camdon Drive had direct access to Route 220. The interchange required these connections to be severed and access roadways were constructed to Kilarney Court and Villa Road. The retaining wall along southbound Route 220 was also built at this time.

The interchange at Joseph Martin Highway and the section of Route 58 to the east of Route 220 that connects to the continuation of Route 58, east of Martinsville, was completed in 1993 (Virginia Highways Project, 2018a).

1.2.1 Previous Studies

I-73 was first identified in the Intermodal Surface Transportation Act, the Federal transportation funding bill of 1991, as part of a high-priority north-south corridor from Detroit, Michigan, to Charleston, South Carolina. In November 1995, the U.S. Congress included the location of this high-priority corridor in Federal legislation under the Transportation Equity Act for the 21st Century (TEA-21). TEA-21, Section 1602 included funding for preliminary engineering and development of a highway facility that would improve access and goods movement along the I-73 corridor, including portions of Route 220 between the North Carolina state line and Roanoke, Virginia. Between July 1997 and December 2012, the Route 220 corridor was included in numerous studies to evaluate possible alternatives for the location of this transportation facility. After several years of inactivity on the corridor, in September 2016, the Commonwealth of Virginia decided to repurpose the previously designated funding to focus the considerations on improvements of the Route 220 corridor that would address not only the regional users of the facility, but also the local traffic utilizing the roadway.

The Martinsville Southern Connector Study is a first step towards identifying future improvements to the Route 220 corridor within its study limits. This is a separate study from the previous environmental analyses of the Route 220 corridor that included other portions of Henry County. The Martinsville Southern Connector Study focuses specifically on identifying and addressing transportation needs along Route 220, between the North Carolina state line and Route 58. Should any future transportation improvements from the study be implemented along the Route

220 corridor, they could potentially be considered for incorporation into an overall interstate system, such as the future I-73 corridor. However, this would require a separate evaluation and analysis to address the needs for this type of facility.

1.3 NEEDS FOR THE PROJECT

The specific needs for the Martinsville Southern Connector Study were developed based on a review of completed plans and previous studies, along with the analysis of current data and projected future conditions compiled for this study. Information was collected through meetings with Federal, state, and local agencies, as well as study stakeholders and the public. A public survey was conducted in the Fall of 2018 to help inform the identified needs for the study. A total of 775 responses were received by VDOT. Refer to **Chapter 6: Comments and Coordination** for more details on the agency involvement, stakeholder coordination, and public comments that have informed the development of this Draft EIS.

Working with FHWA and the Cooperating and Participating Agencies, the Purpose and Need for the study was concurred upon in November 2018. The purpose of the Martinsville Southern Connector Study is to enhance mobility for both local and regional traffic traveling along Route 220 between the North Carolina state line and Route 58 near Martinsville, Virginia.

The Martinsville Southern Connector Study addresses the following needs:

- **Accommodate Regional Traffic** – current inconsistencies in access, travel speeds, and corridor composition along Route 220 inhibits mobility and creates unsafe conditions considering the high volume of truck and personal vehicle traffic traveling through the corridor to origins and destinations north and south of the study area;
- **Accommodate Local Traffic** – numerous, uncontrolled access configurations along Route 220, combined with high through traffic movement create traffic delays and contribute to high crash rates for travelers within the corridor accessing residences, commercial buildings, and schools; and
- **Address Geometric Deficiencies and Inconsistencies** – current geometric conditions along Route 220, such as lane widths, horizontal curves, and stopping sight distances, are below current design standards and vary along the length of the corridor, resulting in safety concerns for all users.

1.3.1 Accommodate Regional Traffic

1.3.1.1 Existing Conditions

Route 220 serves a unique function by connecting the local communities and by connecting areas to the north and south, allowing for regional throughput of freight truck traffic and passenger travel. Beyond the study area boundary, Route 220 is an important regional north-south connection linking employment, shopping, manufacturing, recreational facilities, and research centers to the south, including the Cities of Winston-Salem, Eden, and Greensboro, North Carolina, with those to the north, such as Martinsville, the Town of Rocky Mount, the Town of Boones Mill, and Roanoke, Virginia. As noted in the *VTrans 2040 Multimodal Transportation Plan CoSS Needs Assessment*, there are no parallel roadway facilities to Route 220 that accommodate inter-city travel between the North Carolina border and Roanoke (OIPI, 2015). Route 220 is the only north-south connection along the North Carolina to West Virginia CoSS that is functionally classified as an other principal arterial, intended to serve the highest traffic volumes and longest trip desires on this corridor. Other north-south connections with similar or higher order functional classifications, such as Interstates 77, 81, and 85, as well as Route 29, do not provide direct connections between these locations.

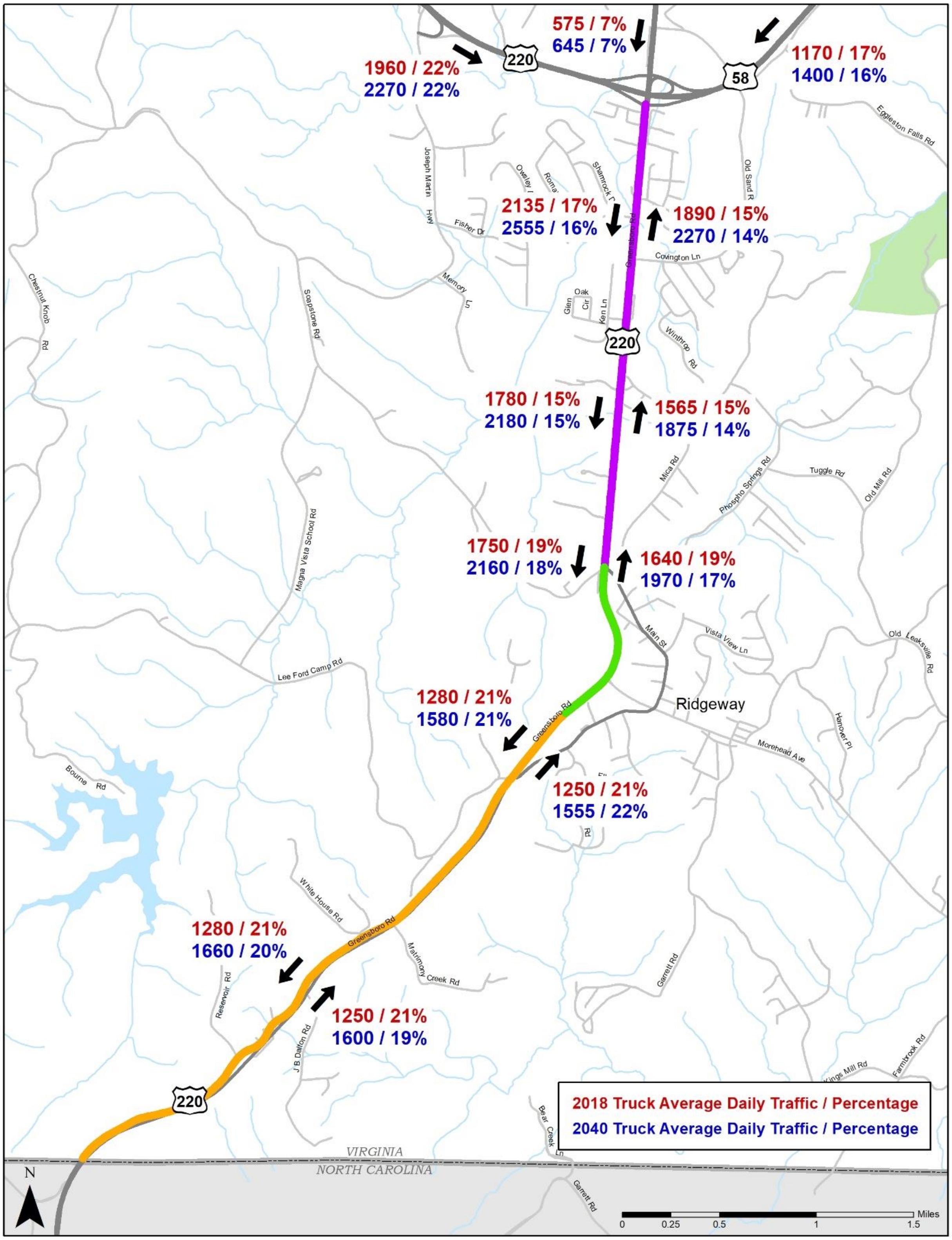
As a significant corridor for regional through movement, Route 220 is a particularly important freight link, with most freight movement accomplished via trucks. As noted in the West Piedmont Planning District Commission's (WPPDC) *Corridors of Statewide Significance: North Carolina to West Virginia Corridor – U.S. 220* report, trucking accounts for 77 percent of freight tonnage and over 99 percent of the freight value along Route 220. Freight rail accounts for the remainder of the total freight movement on Norfolk Southern rail lines, which run parallel to Route 220 in the study area (WPPDC, 2013). Within the study area, Route 220 exhibits high truck volumes. Just north of the North Carolina state line, the existing truck percentages for Route 220 are approximately 21 percent for both the northbound and southbound directions, as shown in **Figure 1-3**. Comparatively, truck percentages average approximately six percent on all statewide primaries and 5.8 percent on similar primary facilities in VDOT's Salem District (Virginia Roads, 2018).

Additionally, according to American Association of State Highway Transportation Official's (AASHTO) 2011 *A Policy on Geometric Design of Highways and Streets (*Green Book), which has been formally adopted by VDOT as the minimum design standards for state-maintained roadways, trucks have a greater individual effect on highway traffic operation than passenger vehicles. The effect on traffic operation of one truck is often equivalent to several passenger cars[11]. Therefore, the larger the proportion of trucks in a traffic stream, the greater the equivalent traffic demand (AASHTO, 2011). Additionally, according to the National Highway Traffic Safety Administration's *Large-Truck Crash Causation Study: An Initial Overview* report, passengers in vehicles other than large trucks are more likely to be seriously injured than are occupants in large trucks, when these two different vehicle types collide (NHTSA, 2006). Therefore, the high percent of trucks within and in the vicinity of the study area increases the potential for more severe crashes and adversely affects traffic operations and mobility for regional as well as local traffic.

Route 220 freight truck traffic is generated by a variety of sources, both within and beyond the study area. Local intermodal facilities within Martinsville and the study area, including the Radial Fulfillment Centers on Joseph Martin Highway as well as DDI Logistics, KBEL Transport, and Warren Trucking, contribute to the high percentage of truck volumes on Route 220. Manufacturing centers including Nationwide Homes, Hopkins Lumber, and the multiple businesses in the Martinsville Industrial Park, North Bowles Industrial Park, and Patriot Centre at Beaver Creek are major truck traffic generators as well. Beyond the study area and Martinsville, there are several intermodal facilities that support the transition from air and rail-based cargo to trucks. These intermodal facilities are also major truck generators for the Route 220 corridor. Norfolk Southern operates rail intermodal facilities in the Cities of Greensboro, Winston-Salem, and High Point, as well as the Town of Walkertown, North Carolina. The Walkertown site is primarily used to transfer vehicles between trains and car carriers and the three other rail intermodal facilities are primarily for transfers of containers to or from tractor-trailers.

[11] The number of equivalent passenger cars equaling the effect of one truck is dependent on the roadway gradient and, for two-lane highways, on the available passing sight distance.

Figure 1-3: Average Daily Truck Volumes and Percentages of Traffic



Additionally, the Piedmont Triad International Airport (PTI) in Greensboro, south of the study area, offers many commercial flights and air cargo services and is a multi-modal cargo facility with nearly all major trucking lines operating terminals near the airport (PTI, 2018a). Cargo services are growing at the airport. FedEx announced in September 2018 the expansion of operations at the Greensboro hub from 10 to 18 flights per day (PTI, 2018b). This would result in an increase in the already high number of truck trips traveling from this hub to regional destinations.

In addition to its function as an important north-south corridor for freight truck movement, Route 220 serves to connect areas to the north and south to allow for passenger travel through the region; most of the trips taken on Route 220 within the study area are trips that both begin and end outside of the study area. The average annual daily traffic (AADT) volumes for all the Route 220 segments within the study area, including Morehead Avenue and Route 58, for the base year (2018) as well as the forecasted design year (2040) are shown in **Figure 1-4**.

A limited number of roadways provide access into and out of the study area. Over 83 percent of the total traffic volume within the study area – and 98 percent of the total truck traffic volume within the study area – originates from areas outside of the northern and southern (Route 58 and North Carolina line) study area termini as well as Morehead Avenue in Ridgeway. This traffic passes through the study area to destinations beyond the study area boundary and is considered regional through traffic. AADT volumes and average daily truck volumes (VDOT, 2018a) at these points of entry are shown in **Table 1-1**[12].

Table 1-1: AADT and Truck Volumes

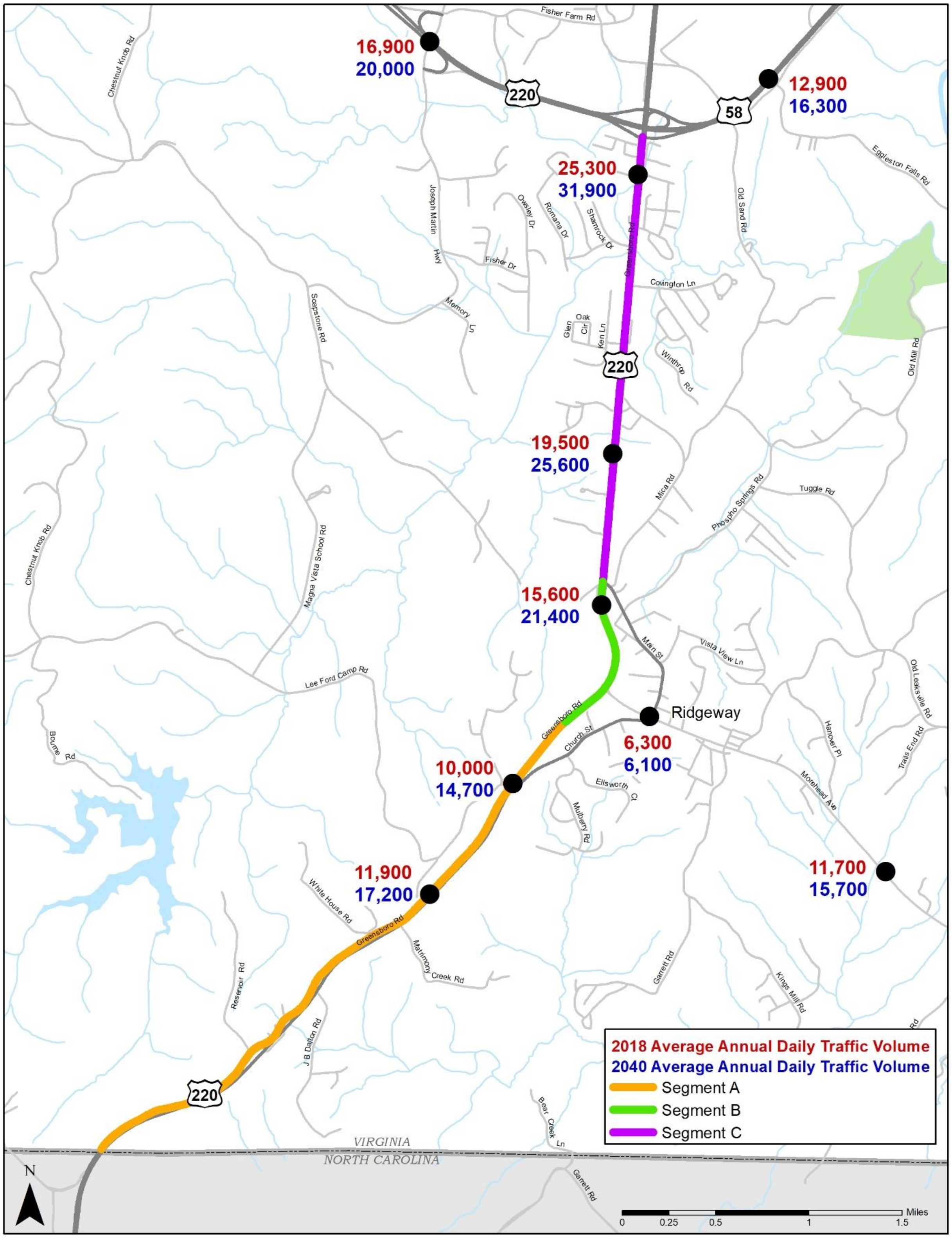
Segment	Volume	Truck Volume	Truck Percentage of Volume	Truck Percentage of Truck Volume Total
Route 220, Southern Limit	**11,960**	**3,030**	**25%**	**36%**
Lee Ford Camp Road	480	50	10%	1%
Soapstone Road	950	20	2%	0.2%
Joseph Martin Highway*	2,800	60	2%	1%
Route 220, Northern Limit	**25,271**	**4,025**	**16%**	**48%**
Old Sand Road*	840	10	1%	0.1%
Old Leaksville Road	1,845	0	0%	0%
Eggleston Falls Road	1,526	15	1%	0.2%
Morehead Avenue	**9,159**	**1,170**	**13%**	**14%**
Kings Mill Road*	1,200	30	3%	0.4%
TOTAL	**56,031**	**8,410**	**15%**	**100%**

Shaded rows indicate traffic originating from areas outside of the study area.
** Indicate estimates derived from VDOT's 2018 Daily Traffic Volume Estimates: Jurisdiction Report 44 (VDOT, 2018a).*
Source: Traffic and Transportation Technical Report (VDOT, 2020a)

Morehead Avenue contributes to the through passenger travel and truck traffic on the corridor, as it provides a direct link between manufacturing centers in Eden, North Carolina and Route 220. The truck traffic using Morehead Avenue to access Route 220 contributes approximately 14 percent of the truck volume in the study area. According to average daily traffic estimates in 2018 (VDOT, 2018a), trucks represented approximately six percent of the 6,100 vehicles that traveled through Ridgeway each day on Morehead Avenue. Morehead Avenue also carries over 16 percent of the total traffic into and out of the study area each day.

[12] The regional through trips and local trip volumes and percentages were developed using the latest Virginia statewide land use and transportation forecasting model. Additional discussion of the traffic analysis methodology and data appears in the ***Traffic and Transportation Technical Report*** (VDOT, 2019a).

Figure 1-4: AADT Volumes



Annual daily traffic volumes throughout the study area vary considerably as shown on **Figure 1-4**. The lowest volumes along Route 220 are observed in the southern section of Route 220, between Church Street and Morehead Avenue (10,000 vehicles per day), and the highest volumes are seen just south of the interchange with Route 58 (25,300 vehicles per day) in Segment C. The greatest amount of Route 220 congestion occurs in Segment C. The congestion in Segment C is the result of additional traffic volume, the presence of traffic signals, and the numerous unsignalized residential side streets and driveways for commercial businesses.

There are more drivers traveling through the study area than those beginning or ending their trips within the study area. **Figure 1-5** indicates the regional traffic volumes that enter or exit the study area on different roads and travel through the study area without stopping in it. The percentage of regional traffic that comprise the overall traffic volumes on these different roadways is also indicated on **Figure 1-5**. The majority of these regional through trips are on Route 220. Local roadways, including Joseph Martin Highway and Morehead Avenue, mostly carry drivers that are either beginning or ending their trips within the study area, although these roads carry far less traffic than Route 220.

The dominant movements are north and south within the study area. At the northern interchange between Route 220 and Route 58, nearly 50 percent of the traffic travels to, or comes from, the west, roughly 35 percent of the traffic is from the east, and approximately 15 percent of the traffic is from Business Route 220 and Martinsville, north of the study area.

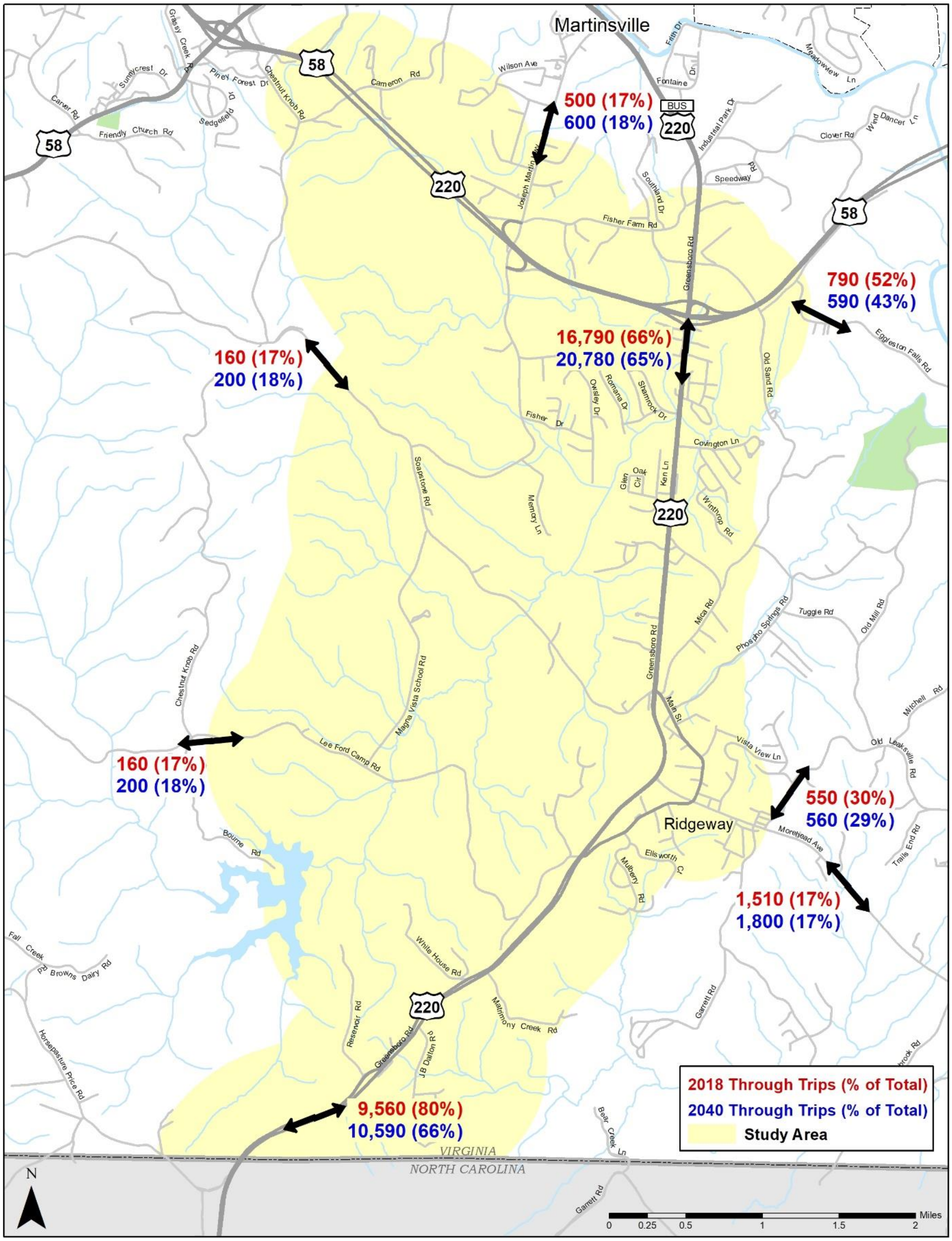
With an understanding of the origins, destinations, and composition of the regional through traffic that Route 220 serves, the effectiveness of the transportation facility to accommodate regional through movements can be measured by end to end travel time. Observed travel times between the Route 58 interchange and the North Carolina state line are generally faster traveling southbound versus northbound. Based on field data collection, average travel times ranged from 8.6 minutes traveling southbound during the afternoon peak hour, to 9.6 minutes traveling northbound during the afternoon peak hour (VDOT, 2020a). If Route 220 did not have traffic signals and vehicles were able to freely travel through the corridor at posted speed limits, it would take a driver eight minutes to travel between the Route 58 and Route 220 interchange and the North Carolina state line. Instead, the mobility of travelers on Route 220 through the study area is inhibited by existing access configurations and travel time delay. Measured travel times for the base year (2018) with the hours of delay compared to free flow conditions are shown in **Table 1-2.**

Table 1-2: Year 2018 Route 220 Travel Times and Delays

	Southbound Travel Time and Delay		Northbound Travel Time and Delay	
	AM	**PM**	**AM**	**PM**
Free Flow Time[1]	8 Minutes	8 Minutes	8 Minutes	8 Minutes
Measured Travel Time (2018)[2]	8.9 Minutes	8.6 Minutes	9.0 Minutes	9.6 Minutes
Hours of Delay (2018)	290 hours per day/ 105,000 hours per year		520 hours per day/ 189,000 hours per year	

[1]Free Flow Time at 55 mph represents the time it would take a driver to travel Route 220 between the Route 58 interchange and the North Carolina state line, without stopping, at posted speed limits.
[2]Measured Travel Times are the average of five trips made on Route 220 between the Route 58 interchange and the North Carolina state line on a typical weekday.

Figure 1-5: Volume and Percentage of Regional Through Trips on Existing Roadways



Depending on the time of day, drivers are delayed from 30 seconds (southbound afternoon peak) to over 90 seconds (northbound afternoon peak) over free-flowing conditions. When applied across all vehicles traveling Route 220 each day, it results in 290 hours of delay in the southbound direction and 520 hours of delay northbound.

1.3.1.2 Future Conditions

Future conditions for the Route 220 corridor in the study area have been assessed for a design year of 2040 to allow for evolution of the transportation system. Traffic volumes in the study area are generally expected to increase by 10 to 30 percent by the year 2040, based on the travel demand model developed for this study, with the greatest percentage increase seen in the southern section of Route 220. The lowest traffic volumes are anticipated to be near Ridgeway, with 14,700 vehicles passing through the study area just north of the Lee Ford Camp Road/Church Street intersection. Future travel demand data can be found in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

Truck traffic is anticipated to increase 20 to 30 percent by 2040; however, the total percentage of trucks relative to all vehicles would decrease. This does not mean the number of trucks would decrease, but rather they would become a smaller component of the overall increasing traffic volumes within the study area. For example, the daily volume of trucks crossing the North Carolina state line in 2018 is approximately 3,030, representing approximately 25 percent of the 11,960 daily traffic volume in this location. The truck volume is anticipated to increase to approximately 3,660 in the year 2040 but would only be 23 percent of the daily traffic volumes of 15,990 vehicles. Even with this slight decrease, the truck percentages are still higher than many of the other similar freight corridors.

It is anticipated that both traffic volumes and truck traffic volumes would increase over time. Continued residential, commercial, and industrial development both within and beyond the study area would drive this increase. The new Commonwealth Crossing Business Centre at the southern limits of Route 220 within the study area is an industrial park of over 700 acres. The industrial park has four lots and access to the site is from Route 692 (Horsepasture Price Road)/Spencer Road in North Carolina. The proximity to regional airports, and easy access to major roadway and rail corridors are noted as means to attract product manufacturers that would require a variety of travel modes for receiving materials and shipping goods (Martinsville-Henry EDC, 2018). The first lot, currently under construction, will be the site of a 280,000 square foot manufacturing operation and anticipates creating over 200 new jobs (Henry County, 2018), which correlates to hundreds of new daily trips. Even though rail would be one of the modes used for shipping raw materials and finished goods to this site, truck trips would increase to varying levels depending on the types of businesses present. As the remaining lots are filled, this business center would increase truck traffic and necessitate efficient and safe ingress/egress for the industrial park. According to FHWA's *Freight Analysis Framework*, trucks are anticipated to remain the primary mover of domestic freight between Virginia and North Carolina (FHWA, 2019a).

As traffic volumes, including truck volumes, increase, the travel times in the study area would likely increase as well. Travel times are expected to increase by five to 10 percent by 2040. A typical northbound trip during the afternoon peak hour currently takes 9.6 minutes; it is expected to increase to 10.5 minutes in 2040 as shown in **Table 1-3**. Additionally, based on these data and findings from other studies documented in this chapter, there is a need to address the increased delay that is anticipated to affect traffic, including a high percentage of trucks, through the corridor to regional destinations. By 2040, it is anticipated that drivers in the corridor would collectively experience an additional 228,000 hours of delay each year.

Table 1-3: Year 2040 Route 220 Travel Time and Delays

	Southbound Travel Time and Delay		Northbound Travel Time and Delay	
	AM	PM	AM	PM
Free Flow Time[1]	8 Minutes	8 Minutes	8 Minutes	8 Minutes
Measured Travel Time (2018)[2]	8.9 Minutes	8.6 Minutes	9.0 Minutes	9.6 Minutes
Hours of Delay (2018)	290 hours per day/ 105,000 hours per year		520 hours per day/ 189,000 hours per year	
Forecasted Travel Time (2040)	9.5 Minutes	9.3 Minutes	9.6 Minutes	10.5 Minutes
Hours of Delay (2040)	550 hours per day / 200,000 hours per year		880 hours per day / 322,000 hours per year	
Change from 2018 to 2040	260 hours per day / 95,000 hours per year		360 hours per day / 133,000 hours per year	

[1]Free Flow Time at 55 mph represents the time it would take a driver to travel Route 220 between the Route 58 interchange and the North Carolina line, without stopping, at posted speed limits.
[2]Measured Travel Times are the average of five trips made on Route 220 between the Route 58 interchange and the North Carolina state line on a typical weekday.

1.3.2 Accommodate Local Traffic

1.3.2.1 Existing Conditions

While Route 220 serves as an important link for freight truck traffic and passenger travel through the region, it also serves as the primary north-south route for the many residents in the local communities, including faculty as well as parents dropping off and picking up children who attend Drewry Mason Elementary School[13], in addition to the business owners and patrons who visit the commercial properties that are along the roadway throughout the study area. The *VTrans 2035 Corridor of Statewide Significance* report for the North Carolina to West Virginia Corridor (Route 220) identifies a need to separate regional through traffic from local traffic between North Carolina and Roanoke and to improve capacity and safety along Route 220 (WPPDC, 2013).

As noted in **Section 1.3.1**, Route 220 is used in many ways within the study area. Segments A and B (see **Figure 1-2**) on the southern end have fewer intersections and a higher posted speed limit of 55 mph. The northern section, Segment C, has a considerable number of business entrances and side streets, as well as a posted speed limit of 45 mph. Most of the local trips within the study area begin or end in Segment C, where there is the greatest number of homes and commercial businesses with direct access to Route 220.

Trips that begin and/or end within the study area represent local trips. The *Corridors of Statewide Significance, North Carolina to West Virginia Corridor – U.S. 220* report (WPPDC, 2013) identified the segment along U.S. 220 between Ridgeway and the Route 58 interchange as having the highest daily traffic in Henry County. The Route 220 AADT volume as shown in **Figure 1-4** is 19,500 vehicles per day just north of Ridgeway and up to 25,300 vehicles per day just south of Route 58. These are the highest volumes along Route 220 in the study area and this represents the most congested segment (Segment A) along existing Route 220 in the study area with the

[13] Drewry Mason Elementary School is a Title I school receiving financial assistance through Title I, Part A of the Elementary and Secondary Education Act. Additional information regarding this facility and other educational institutions in the study area is included in **Section 3.2.1** of the Draft EIS and the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2019c).

highest number of unrestricted access locations. Local trips accessing Route 220 contribute to the higher traffic volumes in this segment.

In comparison, the daily traffic volumes for Route 220 of 25,300 are higher than the volumes of 16,900 vehicles per day on Route 58 west of Route 220. As discussed in **Section 1.1.2**, Route 58 is classified as an other freeway or expressway with full access control, which restricts traffic entering and existing the facility from adjacent side streets, commercial entrances, and residential driveways. Outside of Segment B, Route 220 has direct and unrestricted access, mostly through unsignalized intersections, to businesses, residential developments, and Drewry Mason Elementary School.

While these local destinations are readily accessible, local residents entering the roadway from side streets or trying to cross between the northbound and southbound lanes of Route 220 in the study area experience considerable delays attempting to enter the roadway due to a lack of adequate gaps and insufficient median width to safely execute a two-stage crossing. While this condition is most severe in the northern segment (Segment C), where there is the highest concentration of local access points, delay and safety concerns occur along the length of the corridor wherever there is an uncontrolled access point or crossover. One of the more notable examples of this condition occurs at Drewry Mason Elementary School, which has its main access point along Route 220. Traffic queues often extend onto Route 220 beyond the northbound right turn lane during drop off and pick up times, impeding traffic flow and causing delays and unsafe conditions. Similar conditions occur on the southbound side of the road, as southbound vehicles turn left to cross oncoming traffic to get to the school. The greatest delays are seen during the pick-up hours, between 2:45 and 3:45 PM, every weekday when school is in session.

Users typically wait longer than 1.5 minutes to enter at two of the six unsignalized intersections onto Route 220 north of Ridgeway in both the morning and afternoon peak hours. In addition, the signalized intersection from the Route 58 eastbound ramp to northbound Route 220 exhibits a delay of nearly three minutes during the afternoon peak. The *Highway Capacity Manual* notes that unsignalized intersections experiencing greater than 50 seconds of delay and signalized intersections with over 80 seconds of delay are considered to have a failing level of service (LOS), resulting in congested conditions (TRB 2016). The current average delays at the signalized and unsignalized intersections along Route 220 during peak travel hours are shown in **Table 1-4**. The calculated intersection delays are based on modeled traffic assumptions regarding driver behavior. The average driver, however, is faced with circumstances that do not allow them to wait as long as the model predicts. As volumes and delay increase, drivers may be more inclined to take chances, which could result in more crashes throughout the study area. Driver behavior may change as well; instead of trying to cross the roadway or turn left, drivers may make right turns and go out of their way to unsignalized intersections or median crossovers to make U-turns. This adds more conflict points and potentially introduces additional safety concerns as well as increasing both the travel time and distance it takes for drivers to reach their destinations.

The influence these conditions have on road safety is readily apparent. As shown in **Table 1-5**, there are a considerable number of crashes along Route 220 within the study area, compared to crash rates for the Commonwealth of Virginia, Salem District, and Henry County. The Salem District average crash rate is 0.26 crashes per mile of roadway and the Salem District average injury rate is 0.12 injuries per mile of roadway. The crash rate from 2013-2017 for the study corridor is nearly 24 times the Salem District average at 6.13 crashes per mile of roadway. The injury rate is 20 times the Salem District average at 2.40 injuries per mile of roadway. There were three fatal crashes in the study area over the five-year period from 2013-2017. Additionally, there have been multiple crashes involving overturned tractor trailers on Route 220 within the study area.

Table 1-4: Average Delays and Maximum Vehicle Queues at Unsignalized and Signalized Intersections

Unsignalized Intersection	Average Side Street Delay (2018)		Maximum Side Street Queue Length (2018)	
	AM	PM	AM	PM
Lee Ford Camp Road/Church Street	17 seconds	10 seconds	16 feet	15 feet
Steve Drive/Drewry Mason Elementary School	5 seconds	91 seconds	20 feet	64 feet
Covington Lane	34 seconds	19 seconds	81 feet	20 feet
Shamrock Drive	96 seconds	>180 seconds	220 feet	720 feet
Marrowbone Circle	40 seconds	20 seconds	141 feet	68 feet
Kilarney Court/Villa Road	31 seconds	35 seconds	26 feet	27 feet
Signalized Intersection	**Overall Delay (2018)**		**Maximum Queue Length (2018)**	
Morehead Avenue	33 seconds	30 seconds	315 feet	305 feet
Soapstone Road/Main Street	24 seconds	38 seconds	496 feet	398 feet
Water Plant Road/Mica Road	19 seconds	24 seconds	439 feet	501 feet
Route 58 Eastbound Ramp	43 seconds	169 seconds	451 feet	401 feet
Route 58 Westbound Ramp	12 seconds	19 seconds	182 feet	340 feet

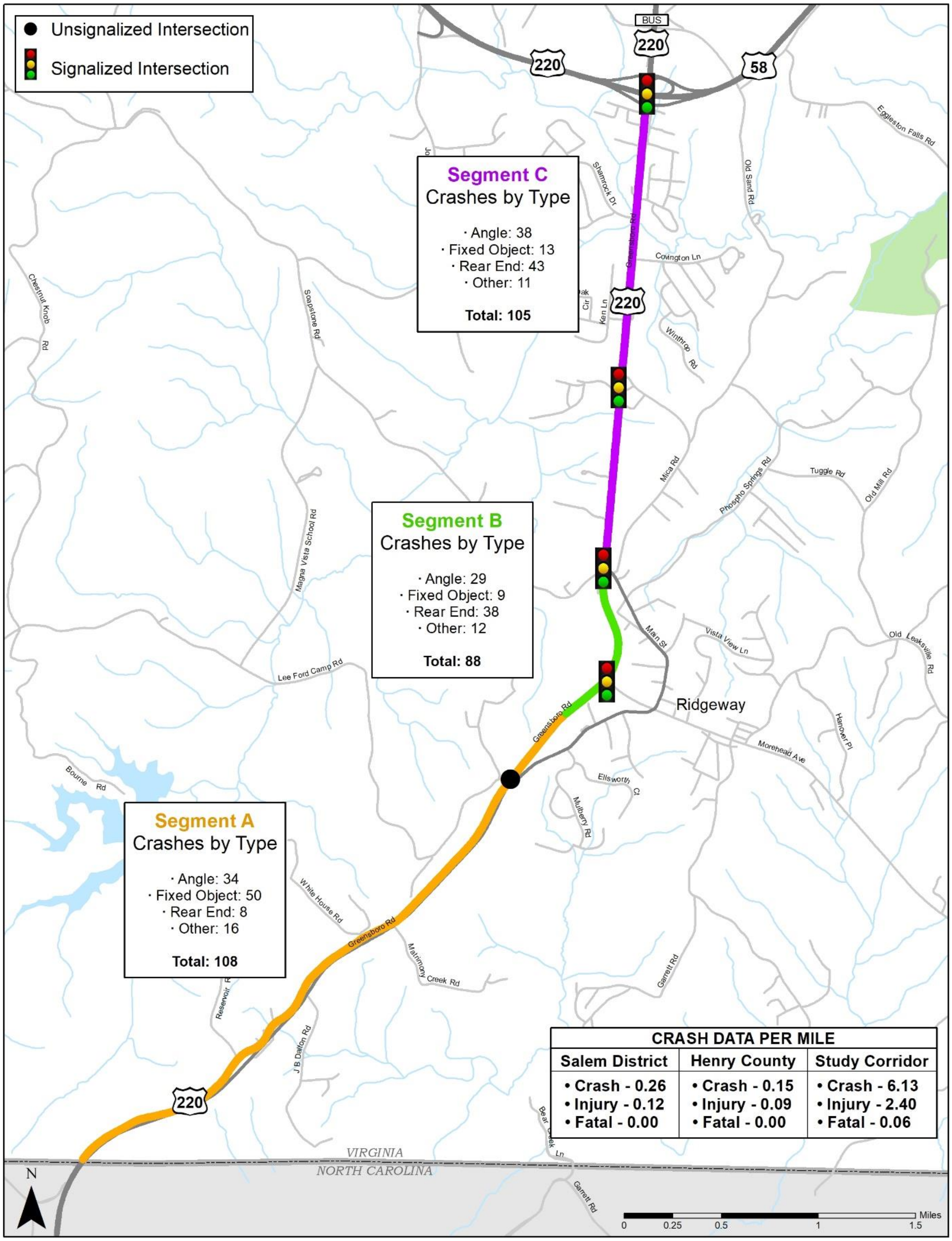
Table 1-5: Crashes Per Year and Crash Rate Per Mile by Jurisdiction

Location	Average Crashes Per Year			Roadway Miles	Crash Rate Per Mile		
	Total	Injury	Fatal		Total	Injury	Fatal
Statewide	124,749	65,225	760	70,105	1.78	0.93	0.01
Salem District	1,869	908	20	7,315	0.26	0.12	0.00
Henry County	128	77	3	837	0.15	0.09	0.00
Study Corridor	43.0	16.9	0.4	7.02	6.13	2.40	0.06
Segment A	15.4	6.7	0.4	3.20	4.82	2.10	0.13
Segment B	12.6	5.6	0.0	1.16	10.84	4.80	0.00
Segment C	15.0	4.6	0.0	2.66	5.64	1.72	0.00

The dominant crash types vary by segment within the study area, as shown in **Figure 1-6**. Between the years of 2013-2017, there were 105 crashes in Segment C. Segment C is where most of the local traffic enters Route 220, the traffic volumes are the highest and there are three signalized and nine unsignalized intersections. The predominant crash types were rear-end (43) and angle (38) crashes. Rear-end crashes are often attributed to congested traffic conditions, while angle crashes can be attributed to turning maneuvers of vehicles entering or exiting the roadway. Angle crashes tend to be more severe than other types of crashes and result in injuries more frequently.

Segment B is a short segment, but accounts for 88 of the 301 total crashes from 2013-2017. The high crash rate is typical for rear-end and angle crashes when approaching a signaled intersection after several miles of free flow traffic. Morehead Avenue is the first signalized intersection along northbound Route 220 between Greensboro and the study area. Prior to reaching the traffic signal at Morehead Avenue in Ridgeway, northbound Route 220 exhibits freeway-type conditions for over 28 miles. Similar to Segment C, the majority of the crashes in Segment B are rear-end (38) and angle (29) crashes (see **Figure 1-6**).

Figure 1-6: Route 220 Crash Data (2013-2017)



CRASH DATA PER MILE		
Salem District	Henry County	Study Corridor
• Crash - 0.26 • Injury - 0.12 • Fatal - 0.00	• Crash - 0.15 • Injury - 0.09 • Fatal - 0.00	• Crash - 6.13 • Injury - 2.40 • Fatal - 0.06

There were 108 crashes in Segment A, with most of them being fixed object (50) and angle (34) crashes. Fixed object crashes can often be indicative of higher speed conditions or roadway geometric deficiencies. The angle crashes in this segment are likely attributed to insufficient stopping sight distances, described in further detail in **Section 1.3.3**, where conflicts occur with vehicles performing turning maneuvers. There are no traffic signals through this segment; however, there are multiple access points from side streets and driveways and the southbound roadway has multiple sharp curves and abrupt vertical changes that limit sight distance.

The number of access points along Route 220 in the study area are shown in **Table 1-6**; each represent a location with multiple conflict points between traffic movements. Conflict points along a roadway, with high traffic volumes, unsignalized intersections, side street delay and multiple driveways increase the potential for crashes to occur. According to AASHTO's *A Policy on Geometric Design of Highways and Streets* (Green Book), as access density increases, there is a corresponding increase in crashes and travel times (AASHTO, 2011).

Table 1-6: Route 220 Access Points by Segment

Segment	Segment A	Segment B	Segment C
Number of access points*	Northbound – 31	Northbound – 2	Northbound – 22
	Southbound – 23	Southbound – 1	Southbound – 52

** Driveways are included as access points*

1.3.2.2 Future Conditions

Under the No-Build condition, by the forecasted design year assumed for the study (2040), AADT is projected to increase along Route 220 by an additional 5,800 vehicles to approximately 25,200 vehicles per day just north of Ridgeway. Similarly, the AADT south of Route 58 is projected to increase by 6,500 vehicles to approximately 32,600 vehicles per day (VDOT, 2020a). The added traffic would cause an increase in congestion and, as a result, vehicular delays and vehicle queues would continue to increase on both the Route 220 mainline as well as on side streets. The anticipated intersection delays and traffic queues for the 2040 design year – if no improvements are made – are shown in **Table 1-7**. A more detailed discussion is available in the ***Traffic and Transportation Technical Report*** (VDOT 2020a).

By 2040, delays would increase at all unsignalized intersections onto Route 220 in Segment C as well as every signalized intersection except Morehead Avenue. Forecasted delays at Morehead Avenue would remain similar to existing conditions, as drivers are expected to divert to Main Street or Church Street, based on the traffic volume projections on these facilities and resulting delay at Morehead Avenue and Route 220 (VDOT, 2020a).

The greatest projected delays are seen at the Route 58 eastbound ramp to northbound Route 220, Shamrock Drive, Marrowbone Circle, and Soapstone Road. According to AASHTO's *A Policy on the Geometric Design of Highways and Streets (Green Book)*, the frequency of traffic crashes on particular highway facilities is strongly influenced by the traffic volumes present. Crash frequencies generally increase with increasing traffic volumes (AASHTO, 2011). Consequently, under future conditions, if no additional improvements to Route 220 are made within the study area, anticipated mobility issues would likely increase the potential for crashes along the Route 220 corridor. Crashes on Route 220 would increasingly lead to severe, unexpected delays due to the limited abilities for vehicles to bypass incidents. Therefore, there is a need to address the conditions that lead to delay and safety concerns for local traffic.

Table 1-7: Intersection Delays and Anticipated Queue Lengths

Unsignalized Intersection	Average Side Street Delay (2018)		Max. Side Street Queue Length (2018)		Average Side Street Delay (2040)		Max. Side Street Queue Length (2040)		Increase in Delay (2018-2040)	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Lee Ford Camp Road/Church Street	17 sec	10 sec	16 ft	15 ft	20 sec	15 sec	20 ft	20 ft	3 sec 20%	5 sec 50%
Steve Drive/ Drewry Mason Elementary School	5 sec	91 sec	20 ft	64 ft	10 sec	110 sec	30 ft	220 ft	5 sec 100%	19 sec 22%
Covington Lane	34 sec	19 sec	81 ft	20 ft	44 sec	30 sec	90 ft	44 ft	10 sec 33%	11 sec 60%
Shamrock Drive	96 sec	>180 sec	220 ft	720 ft	110 sec	>180 sec	270 ft	750 ft	14 sec 15%	N/A
Marrowbone Circle	40 sec	20 sec	141 ft	68 ft	75 sec	27 sec	187 ft	68 ft	35 sec 87%	7 sec 35%
Kilarney Court/Villa Road	31 sec	35 sec	26 ft	27 ft	41 sec	39 sec	37 ft	33 ft	10 sec 30%	4 sec 10%
Signalized Intersection	**Overall Delay (2018)**		**Max. Queue Length (2018)**		**Overall Delay (2040)**		**Max. Queue Length (2040)**		**Increase in Delay (2018-2040)**	
	AM	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**	**AM**	**PM**
Morehead Avenue	33 sec	30 sec	315 ft	305 ft	33 sec	30 sec	315 ft	305 ft	0 sec	0 sec
Soapstone Road/Main Street	24 sec	38 sec	496 ft	308 ft	51 sec	38 sec	883 ft	435 ft	27 sec 10%	0 sec
Water Plant Road/Mica Road	19 sec	24 sec	439 ft	501 ft	38 sec	25 sec	872 ft	494 ft	19 sec 100%	1 sec 4%
Route 58 Eastbound Ramp	43 sec	169 sec	451 ft	401 ft	127 sec	>180 sec	873 ft	1,021 ft	84 sec 190%	N/A
Route 58 Westbound Ramp	12 sec	19 sec	182 ft	340 ft	37 sec	24 sec	450 ft	380 ft	25 sec 208%	5 sec 2%

Based on the traffic model, truck volumes are also predicted to increase considerably. This increase can be contributed to land uses in the Martinsville area serving as logistics centers and industries, such as the Commonwealth Crossing Business Centre, Martinsville Industrial Park, and the developed area south of Martinsville. In order to enhance mobility for this regional through movement, described in **Section 1.3.1**, and to preserve the principal arterial functions the facility is intended to serve, there is a need to improve accommodations for local traffic along Route 220 through the study area. Accommodations for local traffic through the study area are needed to reduce delay for regional traffic but also to improve safety and alleviate delay affecting local trips.

1.3.3 Address Geometric Deficiencies and Inconsistencies

1.3.3.1 Existing Conditions

At select locations along Route 220 throughout the study area, the travel lane widths do not meet design standards and shoulder widths are below the minimum standard required for current design standards. Within the study area, Route 220 consists of two 12-foot travel lanes.

VDOT's *Road Design Manual* lists the minimum required lane width for a rural principal arterial facility of this type[14], such as Route 220, as 12 feet (VDOT, 2018b). However, according to AASHTO's *Green Book*, the tight curves in Segment A necessitate lane widths of 13 or 14 feet to account for larger vehicles turning radii. VDOT's *Road Design Manual* refers to AASHTO's policy to determine where additional pavement width, beyond the minimum standard, may be needed (VDOT, 2018b).

Throughout the study area, Route 220 exhibits substandard shoulder widths, with a shoulder width that varies between one and four feet on both the inside and outside travel lanes. *VDOT's Road Design Manual* lists the minimum width for a paved shoulder on a principal arterial as four feet for inside shoulders and eight feet for outside shoulders (VDOT, 2018b). Today's design standards (AASHTO, 2011) recommend wider pavement area with an increase in the lane and shoulder width on roadway curves that have tight radii, especially on roadways that exhibit high volumes of trucks. The shoulders on both the northbound and southbound Route 220 roadway, in many locations and on several curves, are non-existent or are less than the minimum required.

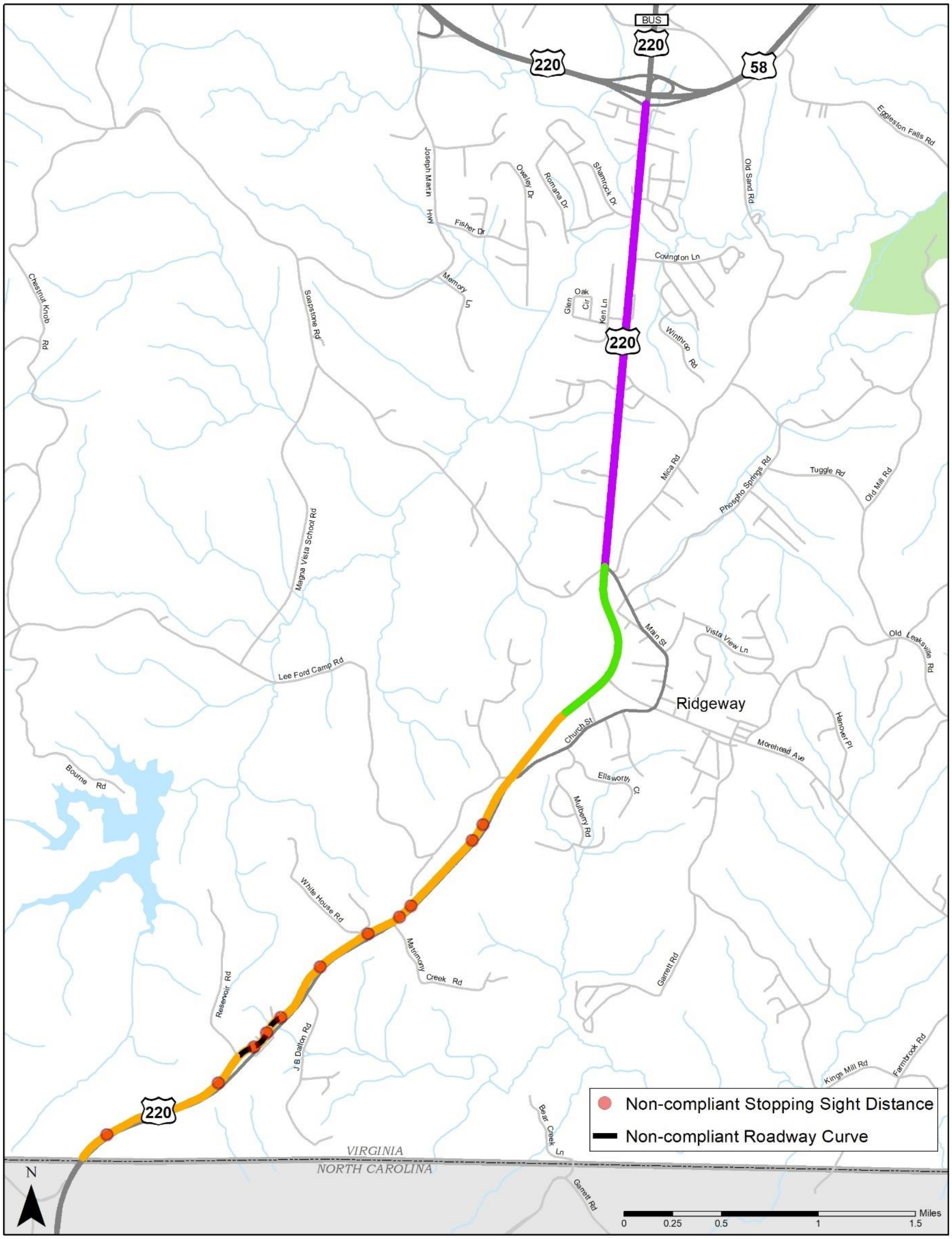
Three of the horizontal curves on the southbound roadway in Segment A do not meet the current minimum design standards for the 55 mph posted speed. The radii for some of the horizontal curves are 751, 732 and 732 feet. The minimum radius according to VDOT's *Road and Bridge Standards* is 964 feet (VDOT, 2016).

In addition to sub-standard horizontal curves, the stopping sight distances at 11 locations on the southbound travel lanes in Segment A, from the North Carolina state line to Ridgeway, do not meet current design standards outlined in VDOT's *Road Design Manual* (VDOT, 2018b). In three instances, the combination of a substandard roadway curve occurs at the same location where stopping sight distances are limited, as the crest of a hill creates a situation where drivers likely do not have enough time to react to vehicles entering from side streets or stopped traffic. These curves are often posted with an advisory speed that is lower than the posted speed for the roadway. The locations where these 14 identified geometric deficiencies occur are shown in **Figure 1-7.** In addition, there are several school bus stops along Route 220 in the areas with poor geometrics and limited driver sight distance. Warning signs have been placed to warn motorists of these locations.

In summary, many of the curves on the corridor do not meet modern design standards. This causes delays as drivers slow down and/or creates unsafe conditions as drivers proceed at posted speeds or greater. In addition, many of the sight distances along the corridor do not meet design standards, due to these curves or steep grades. Crashes resulting from these geometric deficiencies create non-recurring delays and safety concerns, especially given the high volume of truck traffic on the corridor. Finally, these conditions contribute to delay and safety concerns as local drivers access or cross over Route 220 and are unable to see oncoming traffic or find sufficient space in traffic to perform turning maneuvers.

[14] The design criteria presented in this Draft EIS are based on the functional classification of Route 220 with a design speed of 60 mph, for which the applicable geometric design standards are derived from the Rural Principal Arterial (GS-1) in VDOT's *Road Design Manual* (VDOT, 2018b).

Figure 1-7: Route 220 Geometric Deficiencies



In addition to the geometric deficiencies identified along Route 220 within the study area, there are a number of conditions that represent geometric inconsistencies, which contribute to the delay and safety concerns previously discussed, and also limit the ability of the facility to serve its intended function as an other principal arterial. Through the study area, Route 220 serves as an important link between Route 58 and North Carolina. North of the study area, Route 58 provides priority service to the regional through movements bypassing central Martinsville, which is accomplished through the implementation of full access control. Similarly, south of the study area, Route 220 continues into North Carolina where it is functionally classified as an other principal arterial until transitioning into an interstate facility south of the metropolitan area of Greensboro. In North Carolina, Route 220 serves as an arterial service road through partial access control, with at-grade and grade-separated access connections to selected public roadways and private driveways. Within the study area, particularly the section from Ridgeway to the Route 220 interchange with Route 58 (Segment C), Route 220 operates similarly to a suburban arterial with uncontrolled access to commercial properties, although the functional classification of Route 220 is the same (other principal arterial) throughout the study area.

The change in the roadway characteristics throughout the study area presents the users with unexpected roadway features – signalized intersections, school bus stops on Route 220, and numerous uncontrolled access points. The signal at Morehead Avenue is the first traffic signal that northbound drivers encounter for 28 miles, as all the major crossroads in North Carolina to I-73 in Greensboro have been replaced with interchanges. These unexpected roadway characteristics cause traffic delays and safety hazards.

The deceleration and acceleration lanes for turning vehicles throughout the study area – most prevalent in Segment C – are substandard in that they do not provide adequate length for drivers to exit the travel lanes and then slow to negotiate turning movements into side streets or median crossovers. This includes the queued vehicles waiting to enter the Drewry Mason Elementary School during student pick-up. Over most of the study area, the paved shoulder widths are less than the recommended four feet (in the median) and 10 feet to the outside of the roadway. The shoulders vary in width throughout the study area.

Finally, the median crossovers in many locations are not wide enough for larger vehicles like trucks or school buses to cross or make left turns onto Route 220 in two stages, where they first cross into the median and then safely wait to cross the next two lanes. In some cases, vehicles have been observed to block portions of the existing travel lane while waiting to turn. The Church Street/Lee Ford Camp Road intersection with Route 220 is an example of this unsafe practice.

1.3.3.2 Future Conditions

Traffic volumes on existing Route 220 are forecasted to increase to over 31,000 vehicles per day in the year 2040. Based on current and future land use and transportation needs in the study area, the number of entrances and conflict points on Route 220 are anticipated to remain consistent. In addition, only routine maintenance would be undertaken, and no major transportation improvements are currently funded for improving the geometric deficiencies and inconsistencies in the study area. Therefore, under the No-Build condition, the increased traffic volumes combined with the identified geometric deficiencies, segment inconsistencies, and the number of conflict points may contribute to an increase in the number of future crashes and delays.

1.3.4 Public Input on Purpose and Need

Public feedback solicited during the development of this Draft EIS supports the elements of need described in this section. The public survey conducted in Fall 2018 supported many of the issues identified in the preceding sections. A total of 775 responses were received by VDOT. Refer to **Chapter 6: Comments and Coordination** of the Draft EIS for more information on the public involvement, as well as agency input, during the development of this study. In support of the need elements identified through this study, the public survey conducted indicated the following primary themes:

1) Over 40 percent of those who responded to the survey indicated that they are passing through the study area when they use Route 220; suggesting that nearly half of the respondents use the corridor enough to participate in the survey but are only passing through the area as regional through traffic. This supports the need for regional traffic accommodations;
2) Approximately 32 percent of the survey respondents use Route 220 daily, while just over 32 percent use Route 220 about once a week. This suggests that nearly a third of the respondents only pass through the corridor once a week, rather than daily travel conducted by local travelers, which further supports the identified need for regional traffic accommodations;
3) Approximately 17 percent of respondents indicated that they travel Route 220 to reach doctors, family, churches, and other destinations that are outside the corridor, which emphasizes the importance of regional traffic accommodations but also as supports the identified need for local traffic accommodations;
4) Over 55 percent of the survey respondents indicated that they used Route 220 for entertainment (shopping, dining, etc.) with an additional 30 percent using Route 220 for business. This indicates that, while a large portion of the traffic volume is regional through traffic, the majority of the interested parties' responses to the survey were from local users. These local users identified safety, road conditions, traffic congestion, and overall delay as issues. The only road condition of Route 220 that received favorable input from the public was access to local destinations, with 40 percent of the respondents answering positively. This suggests that despite the problems identified along the corridor, local users appreciate how destinations are accessible and supports the identified need for local traffic accommodations.

1.4 SUMMARY

Based on the existing and future conditions and findings, the purpose of the Martinsville Southern Connector Study is to enhance mobility for both local and regional traffic traveling along Route 220 between the North Carolina state line and Route 58 near Martinsville, Virginia.

The Martinsville Southern Connector Study addresses the following needs:

- **Accommodate Regional Traffic –** current inconsistencies in access, travel speeds, and corridor composition along Route 220 inhibits mobility and creates unsafe conditions considering the high volume of truck and personal vehicle traffic traveling through the corridor to origins and destinations north and south of the study area;
- **Accommodate Local Traffic** – numerous, uncontrolled access configurations along Route 220, combined with high through traffic movement, create traffic delays and contribute to high crash rates for travelers within the corridor accessing residences, commercial buildings, and schools; and
- **Address Geometric Deficiencies and Inconsistencies** – current geometric conditions along Route 220, such as lane widths, horizontal curves, and stopping sight distances, are below current design standards and vary along the length of the corridor, resulting in safety concerns for all users.

CHAPTER 2

Alternatives

2. ALTERNATIVES

The implementing regulations for the National Environmental Policy Act of 1969 (NEPA) require that project sponsors consider a reasonable range of alternatives prior to an action (40 CFR §1505.1). The range of alternatives considered in this Draft Environmental Impact Statement (EIS) have been developed through extensive coordination with Cooperating and Participating Agencies involved in the study and informed by public comment. This chapter explains the identification of potential transportation solutions; discusses the alignment options initially considered; details the alignment options not carried forward; explains the alternatives carried forward for evaluation; and identifies the Preferred Alternative. In addition to the No-Build Alternative, which serves as a baseline for alternatives comparison, three Build Alternatives have been retained in this Draft EIS and are described in detail in the sections that follow. Of these Alternatives, Alternative C has been identified as the Preferred Alternative for the Martinsville Southern Connector Study.

The alternatives development process, analysis, and the identification of the Preferred Alternative are included in the sections that follow. More detailed information on the alternatives development process is documented in the ***Alternatives Analysis Technical Report*** (VDOT, 2020b).

2.1 ALTERNATIVES DEVELOPMENT PROCESS

Consistent with NEPA regulations, Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), with input from the Cooperating and Participating Agencies, and informed by public comment, considered a range of alignment options to address the established Purpose and Need for the Route 220 corridor (see **Chapter 1: Purpose and Need** and **Chapter 6: Comments and Coordination**). A number of these alignment options were not carried forward from consideration based on their inability to meet the Purpose and Need established. The alignment options carried forward were developed into alternatives carried forward for detailed evaluation in this Draft EIS.

The alternatives analyzed in this Draft EIS have been developed to determine the potential worst-case impacts for a project that may advance from the Martinsville Southern Connector Study. The alternatives evaluated do not represent a detailed design of all potential solutions. Instead, the assessment of potential environmental consequences of the alternatives evaluated in this Draft EIS focuses on preliminary engineering and design, in order to provide a relative comparison of impacts and to inform the identification of a Preferred Alternative. Should the Preferred Alternative advance from the Martinsville Southern Connector Study, additional engineering and associated impact analyses would be developed as part of the detailed design phase. As part of advanced engineering and design, additional impacts to environmental resources may be identified, or further avoided, minimized, or mitigated as necessary.

2.1.1 Study Initiation

Initial input on the Draft EIS and the consideration of alignment options for the Route 220 corridor within the study area began when FHWA issued a Notice of Intent (NOI) to prepare an EIS (83 Fed. Reg. 7841, 2018).

Upon publication of the NOI, the scoping process was initiated for the study and interested individuals, organizations, and agencies were invited to provide their ideas, comments and concerns regarding the identification of a reasonable range of alternatives to be considered for evaluation along the Route 220 corridor in Henry County, Virginia. In order to solicit public comment, a study scoping meeting was conducted in May 2018. Agency scoping feedback was solicited through formal scoping correspondence and during monthly coordination meetings, which began at the start of the study consistent with the collaborative intent of the merged process (see **Chapter 6: Comments and Coordination**).

2.1.2 Evaluation of Alignment Options

Chapter 1: Purpose and Need describes in detail the Purpose and Need for the Martinsville Southern Connector Study. The Purpose and Need served as the primary criteria in the alternatives development process. Once alignment options were identified, they were evaluated to determine whether they would address the Purpose and Need. Alignment options that were determined to not satisfy the Purpose and Need were not carried forward for detailed evaluation. **Table 2-1** is a summary of how the range of alignment options were evaluated relative to each element of the Purpose and Need statement.

Table 2-1: Purpose and Need Evaluation Criteria

Purpose and Need Element	How Alignment Options are Evaluated
Accommodate Regional Traffic – Current inconsistencies in access, travel speeds, and corridor composition along Route 220 inhibits mobility and creates unsafe conditions considering the high volume of truck and personal vehicle traffic traveling through the corridor to origins and destinations north and south of the study area.	Alignment options that meet this need would eliminate or reduce conflict between regional and local traffic in a manner that accommodates regional origins and destinations and the high volume of trucks and vehicle traffic that currently use and are anticipated to travel the corridor.
Accommodate Local Traffic – numerous, uncontrolled access configurations along Route 220, combined with high regional through traffic movement create traffic delays and contribute to high crash rates for travelers within the corridor accessing residences, commercial buildings, and schools.	Alignment options that meet this need would eliminate or reduce unsafe interactions between local and regional traffic, while maintaining adequate local access.
Address Geometric Deficiencies and Inconsistencies – Current geometric conditions along Route 220, such as lane widths, horizontal curves, and stopping sight distances, are below current design standards and vary along the length of the corridor, resulting in safety concerns for all users.	Alignment options that meet this need would address the current geometric deficiencies and inconsistencies on Route 220, thus improving driver safety by meeting current design standards for geometry, clear zone and access management.

2.1.3 Design Considerations and Assumptions

VDOT considered a number of alignment options that represented potential solutions to address the identified Purpose and Need. These initial alignments options were presented to the Cooperating and Participating Agencies as well as the public (see **Chapter 6: Comments and Coordination** for more information). During monthly meetings with the agencies and as part of the public outreach efforts, several additional options for Route 220 improvements were identified for potential consideration.

For the purposes of evaluating transportation improvements along the Route 220 corridor in the study area, full access control[15] was assumed to represent the worst-case scenario for environmental impacts and costs. During discussions on alignment options with the agencies in November 2018, VDOT recommended that the analyses in this Draft EIS would assume full access control as a worst-case scenario but would not commit to which type of control would be

[15] Full control of access means that preference is given to regional through traffic by providing access connections at interchanges with only selected public roads and by prohibiting crossings at grade and direct private driveway connections (AASHTO, 2011). Full control of access is provided by means of ramp connections with only selected public roads, providing preference to regional through traffic. Restricting access to other at-grade roadway crossings and adjacent properties functions to preserve the mobility of regional through traffic movements and to manage the interference of vehicles or pedestrians entering, leaving, and crossing the roadway.

implemented in the future. Access control would provide accommodations for the primary regional through movements, while maintaining consistency with the intended function of existing Route 220 as an other principal arterial and Corridor of Statewide Significance (CoSS). The implementation of access control would also be consistent with the access control measures on Route 58 to the west of the study area as well as Route 220 north of the study area and south of the study area in North Carolina. The United States Army Corps of Engineers (USACE) agreed with this approach and there were no other comments or objections from other agencies. As a result, specific access management options may be determined as the environmental review process advances, which could be documented in the Final EIS and included in any future permit conditions. A determination on access control may also be deferred until a later date when more detailed design advances and if funding for future phases of the project development process should become available. As a result, no commitments related to specific access control measures are made in this Draft EIS[16].

2.2 ALIGNMENT OPTIONS INITIALLY CONSIDERED

A number of alignment options for Route 220 improvements were initially identified. The 11 alignment options identified are illustrated in **Figure 2-1** and listed in **Table 2-2**. In addition to these alignment options, multimodal transportation options were considered to determine whether there were other possible solutions to address the Purpose and Need.

In order to implement an access-controlled facility, each alignment option identified potential interchange locations, as illustrated on **Figure 2-1**. Interchange locations were developed to provide an illustrative planning level design that represents a worst-case limit of disturbance (LOD). Should any improvements from the Martinsville Southern Connector Study advance to more detailed phases of project development, the final interchange location and configuration would be refined.

Each of the alignment options were evaluated based on engineering feasibility and whether they met the Purpose and Need. The alignment options were presented at the January 23, 2019 Citizen Information Meeting (CIM) and discussed at monthly agency coordination meetings (see **Chapter 6: Comments and Coordination** for more information). As a result of monthly discussions with agencies and input from the public, VDOT recommended that Alignment Options 1, 3, 4A, 4B, and 4D be carried forward for consideration and that Alignment Options 2, 4C, 5A, 5B, 5C, and 5D not be carried forward for further consideration. At the March 2019 agency meeting, the Concurring Agencies, informed by public comment, concurred with VDOT's recommendations to consider Alignment Options 1, 3, 4A, 4B, and 4D and further recommended that a modification to Alignment Option 4C also be carried forward for consideration. The alignment options carried forward for consideration in the Draft EIS and those recommended not to be carried forward for detailed evaluation are described in the sections that follow. Justification for retaining or eliminating options from detailed study, based on the ability of each option to address the Purpose and Need, is included in the description of each alignment option.

[16] The Commonwealth Transportation Board (CTB) has the authority to regulate limited access highways (§33.2-401 of the Code of Virginia) and The Commonwealth Transportation Commissioner is conferred the power to apply access management standards to preserve the efficient operation of the state highway system (§33.1-198.1 of the Code of Virginia).

Figure 2-1: Alignment Options Considered

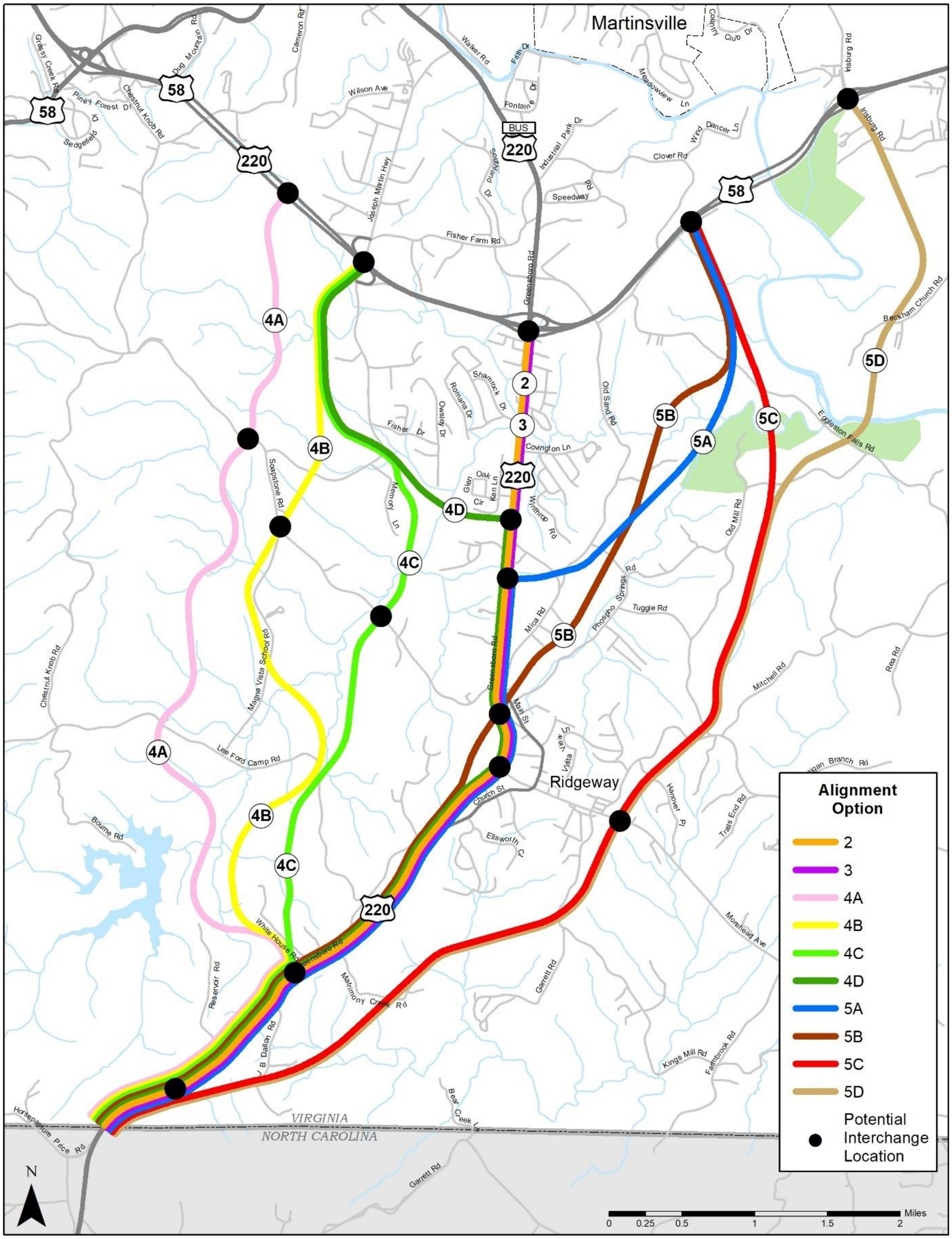


Table 2-2: Alignment Options Initially Considered

Alignment Option	Description
Alignment Option 1	No-Build option, required by NEPA to provide a baseline comparison of alternatives, assumes projects within the study area that are currently programmed in VDOT's *Six-Year Improvement Program (SYIP) for Fiscal Year (FY) 2020 – 2025* and Henry County's *Budget for FY 2019-2020*.
Alignment Option 2	Transportation System Management (TSM) and Transportation Demand Management (TDM) improvements, which may include, but are not limited to geometric improvements on the existing roadway to consolidate driveway entrances and conflict points, installation of intelligent transportation systems (ITS) devices and synchronized signal timings, or alternative intersection and interchange designs.
Alignment Option 3	Reconstruct Route 220 as an access-controlled roadway, consolidating access to Route 220 to interchanges at select locations.
Alignment Option 4A	New access-controlled alignment west of Route 220 with a new interchange with Route 220/Route 58 to the west of Route 641 (Joseph Martin Highway). Includes reconstruction of existing Route 220 alignment for 0.5 miles from the North Carolina state line.
Alignment Option 4B	New access-controlled alignment west of Route 220 and west of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 220/Route 58. Includes reconstruction of existing Route 220 alignment for 0.5 miles from the North Carolina state line.
Alignment Option 4C	New access-controlled alignment to the west of Route 220 and east of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 220/Route 58. Includes reconstruction of existing Route 220 alignment for 0.5 miles from the North Carolina state line.
Alignment Option 4D	Reconstruction of Route 220 to an access-controlled roadway, with a spur on new alignment to the west, north of Ridgeway, and reconstruction of the Joseph Martin interchange at Route 220/Route 58.
Alignment Option 5A	Reconstruction of Route 220 to an access-controlled roadway, with a spur on new alignment to the east, north of Ridgeway, and a new interchange with Route 58 approximately one mile east of the Route 220/Route 58 interchange.
Alignment Option 5B	Reconstruction of Route 220 to an access-controlled roadway, with a spur on new alignment near Ridgeway, following the west side of the railroad to a new interchange with Route 58 approximately 0.5 miles east of the Route 220/Route 58 interchange.
Alignment Option 5C	New access-controlled alignment east of Route 220 with a new interchange with Route 58 approximately one mile east of the Route 220/Route 58 interchange. Includes reconstruction of existing Route 220 alignment for 0.5 miles from the North Carolina state line.
Alignment Option 5D	New access-controlled alignment east of Route 220 with a new interchange with Route 58 at Route 650 (Irisburg Road). Includes reconstruction of existing Route 220 alignment for 0.5 miles from the North Carolina state line.

2.3 ALIGNMENT OPTIONS NOT CARRIED FORWARD

2.3.1 Alignment Option 2 – Transportation System Management and Transportation Demand Management Improvements

Alignment Option 2 would maintain Route 220 as it exists today, with improvements to more effectively control the movement of traffic or reduce travel demand within the existing roadway footprint. Transportation System Management (TSM) improvements are primarily focused on reducing congestion or increasing mobility, while Transportation Demand Management (TDM) improvements are intended to influence behaviors of travelers utilizing a roadway facility, through ridesharing incentives, telework, options, or other strategies and policies to reduce or redistribute travel demand. Examples of TSM that could be implemented within the study area include, but are not limited to incorporating adaptive traffic signals or other ITS devices to better control traffic flow and provide consistent travel times through the corridor; modifying intersections to reduce the number of conflict points and improve sight distance; combining or eliminating driveways to reduce the number of access points; and constructing low-cost geometric improvements such as lengthening turn lanes and widening shoulders. TDM strategies may include constructing park-and-ride facilities within the study area, improvements (e.g., sidewalks, crosswalks) for non-motorized users, and encouraging other ways to reduce the number of daily trips in the study area, such as teleworking and carpooling.

2.3.1.1 Accommodating Regional Traffic

TSM and TDM improvements may improve localized mobility and provide some measure of improved mobility for regional traffic traveling through the study area; however, in the absence of access control, the regional traffic would still be subject to conflict points and interference with local access through the study area. Regional traffic travel times would not likely be substantially decreased through the implementation of TSM and TDM improvements, as local access conflicts would remain along Route 220 in the study area. Since focused isolated improvements would not address all elements of the identified Purpose and Need along the corridor, a TSM and TDM alternative was not carried forward. TSM and TDM improvements, however, would not be precluded from future implementation outside the scope of this study.

2.3.1.2 Accommodating Local Traffic

Considering the local and regional traffic characteristics of Route 220 in the study area, benefits to local traffic associated with the implementation of any TSM and TDM measures would be minimal as interference created by the volume of trucks and other regional traffic would continue to inhibit local mobility, even with access improvements potentially associated with TSM and TDM. Additionally, those improvements that would benefit regional traffic mobility would likely have some negative impact on local traffic by eliminating driveways and existing access on Route 220. Implementation of innovative intersections at particular locations along the corridor may result in right of way impacts to the multiple residential and commercial properties that currently have access or property frontage along existing Route 220.

2.3.1.3 Addressing Geometric Deficiencies and Inconsistencies

TSM and TDM improvements that modify intersections and traffic signals, reduce conflict points, increase sight distance, consolidate access points, or upgrade shoulders would not address geometric deficiencies and inconsistencies, as the scope of work of these minor improvements would not correct substandard curves and abrupt changes in grade that exist along Route 220.

As a standalone alternative, the TSM and TDM alignment option does not satisfy the study's Purpose and Need; however, implementation of TSM and TDM improvements is not precluded from being implemented as part of any improvements that may advance from this study and/or as standalone projects along the Route 220 corridor.

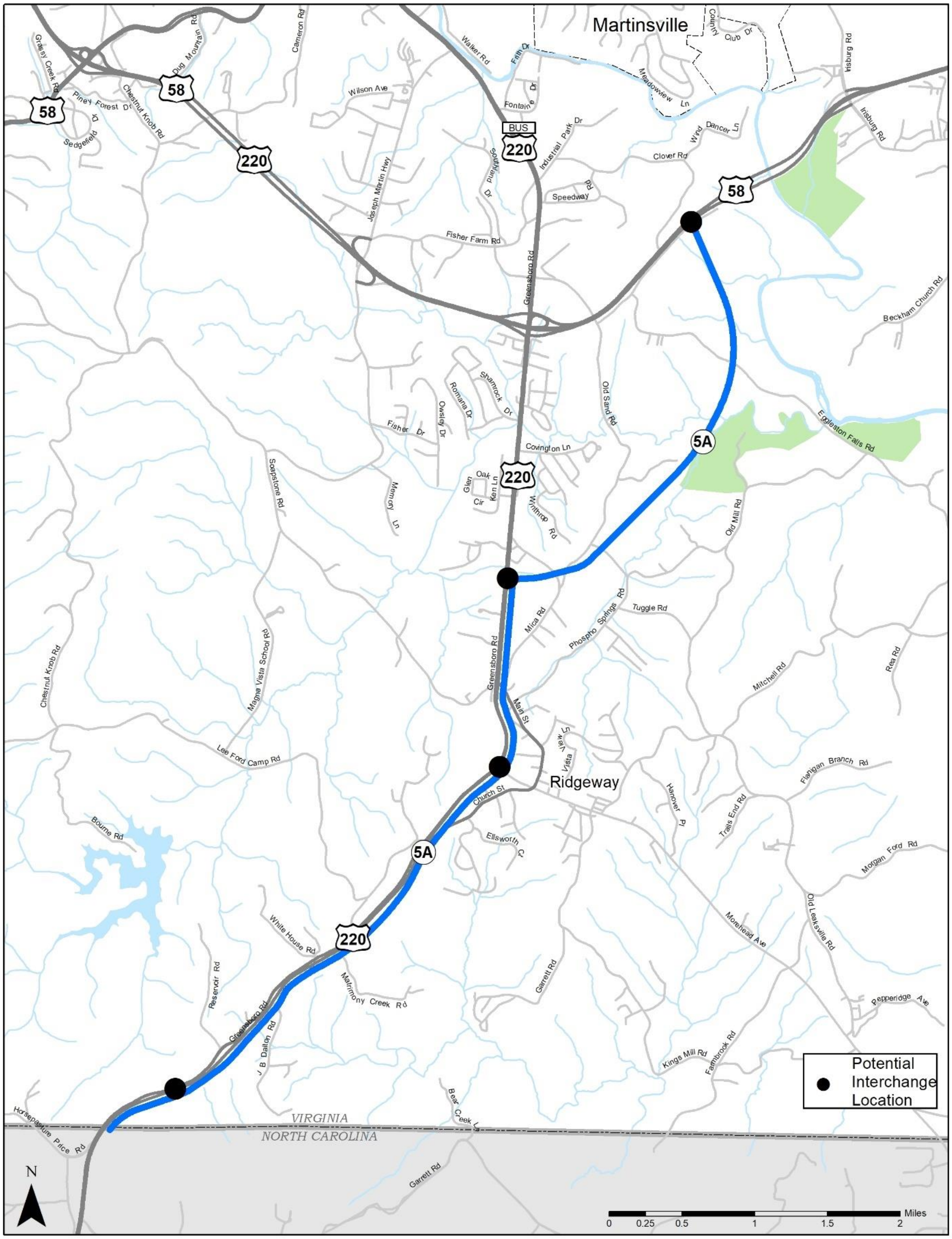
2.3.1.4 Other Considerations

Alignment Option 2 was not carried forward for evaluation. TSM and TDM improvements would not address the geometric deficiencies and inconsistencies and would not separate local and regional traffic. The agencies concurred with not carrying forward this alignment option for detailed evaluation on March 13, 2019.

2.3.2 Alignment Option 5A

Alignment Option 5A, shown in **Figure 2-2**, would include reconstruction of existing Route 220 and the incorporation of access control for approximately five miles north of the North Carolina state line until just south of Mica Road. From just south of Mica Road, the facility would then proceed onto new location to the east of existing Route 220, where a new interchange would be built near Route 689 (Reservoir Road). Under Alignment Option 5A, the existing at-grade railroad crossing on Reservoir Road would be maintained.

Figure 2-2: Alignment Option 5A



Grade separations (bridges) would be built at Route 688 (Lee Ford Camp Road)/Church Street and Main Street/Route 687 (Soapstone Road). A new interchange at the location where Alignment Option 5A deviates from Route 220 would provide direct access to Route 220 to the north, as well as access to Soapstone Road, Mica Road, and Route 87 (Morehead Avenue). From this new interchange, the new alignment branches off to the northeast, crossing over Mica Road, parallel to Reds Creek before bridging over the Norfolk Southern railroad and Marrowbone Creek. The alignment continues northeast, proceeding west of Fisher Farm Park, crossing the railroad and Marrowbone Creek. After crossing Marrowbone Creek, the alignment shifts to the north, crossing Eggleston Falls Road and two minor tributaries of the Smith River before tying in to Route 58 at a new interchange approximately 1.2 miles to the east of the interchange at Route 220 and 1.3 miles to the west of the interchange at Irisburg Road.

2.3.2.1 Accommodating Regional Traffic

Existing regional traffic patterns indicate that nearly 85 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks traveling through the study area, 81 percent continue to the west on Route 58. Of the trucks traveling eastbound on Route 58 into the study area, 66 percent continue through without stopping and over two-thirds of them travel southbound on Route 220 to North Carolina. Future traffic forecasting suggests that these regional through travel demand trends will remain relatively consistent in the 2040 design year. In 2040, 78 percent of the trucks entering Route 220 from North Carolina are anticipated to represent regional trips traveling through the study area without stopping. Similarly, 79 percent of truck traffic on Route 58 westbound from Route 220 is expected to be regional traffic in 2040, and 63 percent of the trucks traveling eastbound on Route 58 into the study area represent regional trips.

Alignment Option 5A would benefit regional traffic by providing an access-controlled roadway from the North Carolina state line to Route 58 that would be free of traffic signals, cross streets, and driveways; however, the potential northern interchange located approximately 1.2 miles to the east of the current northern interchange at Route 220/Route 58 creates a more circuitous route for the majority of the regional traffic that travels to and from the west and south, adding approximately three miles to the trip. Those traveling to and from the west and south might be inclined to use Route 220 instead of the new roadway due to its shorter distance and, as a result, shorter travel time.

2.3.2.2 Accommodating Local Traffic

Alignment Option 5A would introduce changes to local traffic patterns. With the implementation of access control in the reconstruction of existing Route 220, all cross streets and driveway entrances that currently have direct access to existing Route 220 from the North Carolina state line to north of the Main Street/Soapstone Road intersection near Ridgeway would connect to frontage roads that would divert traffic to interchanges. Where Alignment Option 5A would divert to new location east of existing Route 220, many residences and businesses from north of Main Street/Soapstone Road, just north of Ridgeway, to the existing interchange with Route 58 would maintain the current access configurations along existing Route 220. A detailed traffic analysis was not performed to determine how the frontage roads would function, as Alignment Option 5A was not carried forward for evaluation. However, 40 percent of 775 respondents to the Purpose and Need survey indicated that access to local destinations was a positive characteristic within the corridor, supporting the need for maintaining accommodations for local traffic on Route 220 in the study area (see **Chapter 6: Comments and Coordination** for more information). While frontage roads would separate regional traffic from local trips, this separation would be detrimental to local traffic – access to local destinations would be impaired and more circuitous routes would be required.

2.3.2.3 Addressing Geometric Deficiencies and Inconsistencies

Under Alignment Option 5A, the full reconstruction of Route 220 from the North Carolina state line to north of the Lee Ford Camp Road/Church Street intersection, just south of Ridgeway, would address the geometric deficiencies on Route 220, as the new construction through this segment would bring the horizontal and vertical curves up to current design standards, providing adequate stopping sight distance through the study area. The removal of these geometric deficiencies and application of access management principles would improve safety by potentially reducing the crash rates that are currently three times higher than the statewide average through this segment. As noted in **Section 1.3.2.1**, over 50 percent of the crashes occurring within this segment can be attributed to geometric deficiencies and insufficient stopping sight distances.

2.3.2.4 Other Considerations

Alignment Option 5A would require four new interchanges to allow access to Route 220, Morehead Avenue, and Route 58; whereas many of the other alignment options considered require only three. Alignment Option 5A would require over four miles of frontage roads from the North Carolina state line to north of Main Street/Soapstone Road intersection near Ridgeway and three new bridges either over or under existing roadways where no interchanges or access would be provided. Alignment Option 5A would require the new roadway to cross over the Norfolk Southern railroad twice – each crossing requires at least 23 feet of vertical clearance from the top of the rail to the bottom of the bridge[17]. The bridge over the railroad on Route 220 north of Ridgeway is one of the two locations, which would need to be fully replaced to accommodate the reconstructed roadway. A new bridge over the railroad would be needed near Fisher Farm Park to the north. The roadway parallels Reds Creek between this new railroad bridge and the new bridge that would be required over Marrowbone Creek, approximately 900 feet to the north, and high retaining walls likely would be needed to minimize grading impacts into Reds Creek. Assuming a maximum grade of four percent the bridge span over Marrowbone Creek would also need to be approximately 70 feet over the creek.

Alignment Option 5A was not carried forward for detailed evaluation in this Draft EIS. While Alignment Option 5A addresses the geometric deficiencies and inconsistencies, the other need elements, including separation of local and regional traffic and truck travel demand particularly north of Lee Ford Camp Road/Church Street to north of the Main Street/Soapstone Road intersection near Ridgeway, would not be met with this option. The anticipated design elements needed to cross the railroad and creeks would also greatly increase the cost, rendering this alignment option not to be considered prudent or practicable for further evaluation or future implementation. The agencies concurred with not carrying forward this alignment option for evaluation on March 13, 2019.

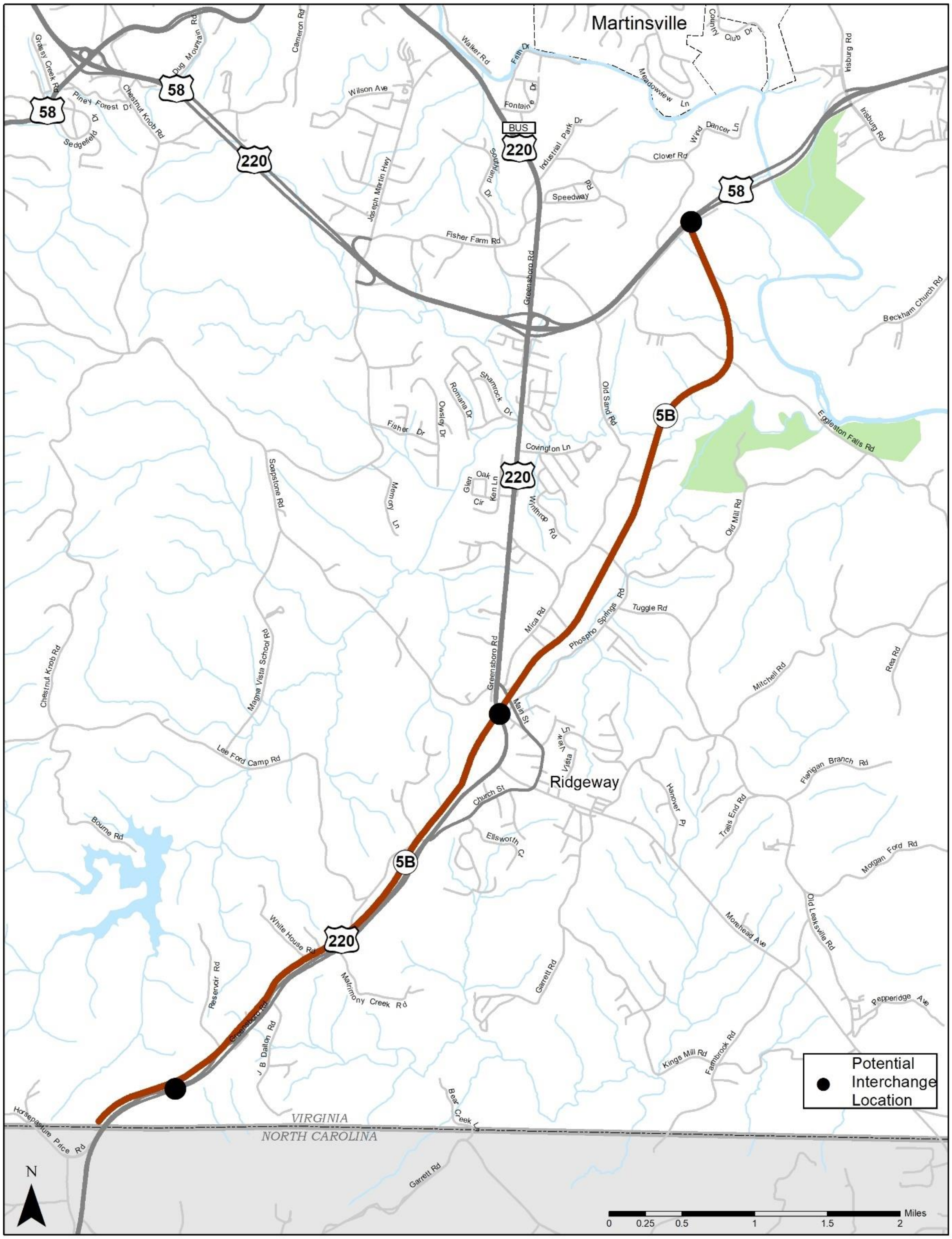
2.3.3 Alignment Option 5B

Alignment Option 5B, shown in **Figure 2-3**, would include reconstruction of existing Route 220 and the incorporation of access control for approximately 3.4 miles north of the North Carolina state line, and divert to the west to cross over the Norfolk Southern railroad, approximately 0.3 miles north of the Lee Ford Camp Road/Church Street intersection. A new interchange would be built near Reservoir Road, as well as a bridge at Lee Ford Camp Road/Church Street. The alignment would then parallel the railroad on its west side beyond Ridgeway.

---

[17] Minimum vertical clearance acceptable for roadway sections crossing the Norfolk Southern Roadway, per VDOT's *Manual of the Structures and Bridge Division*, File No. 06.06-4 (VDOT, 2013).

Figure 2-3: Alignment Option 5B



Morehead Avenue would be extended across the railroad to Soapstone Road and a new interchange would be built to the west; it is also assumed that the existing Route 220 roadway between the point where the alignment would split from Route 220 and Soapstone Road would be abandoned, eliminating the existing bridge over the railroad. North of Ridgeway, the alignment would cross over both Main Street and Mica Road, continuing to the northeast. The alignment would follow the railroad tracks for approximately 1.5 miles and then proceed north to cross Route 638 (Pulaski Road), Marrowbone Creek, and the railroad once again. Alignment Option 5B would then proceed to the northeast, crossing through a large farm area and forest before crossing Eggleston Falls Road. The alignment would then proceed north and follow Alignment Option 5A to Route 58, where a new interchange would be constructed.

2.3.3.1 Accommodating Regional Traffic

Existing regional traffic patterns indicate that most of the travel is to and from the south and west of the study area. Nearly 85 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks traveling through the study area, 81 percent continue to the west on Route 58. Of the trucks traveling eastbound on Route 58 into the study area, 66 percent continue through without stopping and over two-thirds of them travel southbound on Route 220 to North Carolina. Future traffic forecasting suggests that these regional through travel demand trends will remain relatively consistent in the 2040 design year. In 2040, 78 percent of the trucks entering Route 220 from North Carolina are anticipated to represent regional trips traveling through the study area without stopping. Similarly, 79 percent of trucks on Route 58 westbound from Route 220 are expected to be regional truck traffic in 2040, and 63 percent of the trucks traveling eastbound on Route 58 into the study area represent regional trips.

Alignment Option 5B would benefit regional traffic by providing an access-controlled roadway from the North Carolina state line to Route 58 that would be free of traffic signals, cross streets, and driveways; however, the interchange located approximately 1.2 miles to the east of the current northern interchange at Route 58 would create a more circuitous route for the majority of the regional traffic that travels to and from the west and south, adding approximately two miles to the trip. Those traveling to and from the west and south might be inclined to use existing Route 220 instead of the new roadway due to its shorter distance and travel time.

2.3.3.2 Accommodating Local Traffic

Local traffic along Route 220 from the North Carolina state line to north of the Lee Ford Camp Road/Church Street intersection, just south of Ridgeway would be adversely affected, as drivers would need to travel up to two miles along frontage roads to reach a potential interchange at Reservoir Road to access existing Route 220. The removal of regional traffic and crossovers in this segment would eliminate several conflict points and provide an overall safety benefit to both local and regional traffic. A detailed traffic analysis was not performed to determine how the frontage roads would function, as Alignment Option 5B was not carried forward for evaluation. However, 40 percent of 775 respondents to the Purpose and Need survey indicated that access to local destinations was a positive characteristic within the corridor, supporting the need for maintaining accommodations for local traffic on Route 220 in the study area (see **Chapter 6: Comments and Coordination** for more information). While frontage roads would separate regional from local traffic, this separation would be detrimental to local traffic – access to local destinations would be impaired and more circuitous routes, as noted previously, would be required.

2.3.3.3 Addressing Geometric Deficiencies and Inconsistencies

The full reconstruction along Route 220 from the North Carolina state line to north of the Lee Ford Camp Road/Church Street intersection, just south of Ridgeway would address the geometric deficiencies on Route 220, as the new construction through this segment would bring the horizontal and vertical curves up to current design standards providing adequate stopping sight distance through the study area. The removal of these geometric deficiencies and reconstructing Route 220 as an access-controlled roadway would lead to a reduction of the crash rates that are currently three times higher than the statewide average through this segment.

2.3.3.4 Other Considerations

The direct connection evaluated between Soapstone Road and Morehead Avenue would require a third new structure across the Norfolk Southern railroad and considerable grading on each side of the railway for the approach roadways. In addition to the new bridge on Morehead Avenue over the railroad, Alignment Option 5B would require the new Route 220 roadway to cross over the Norfolk Southern railroad twice, with the existing Route 220 crossing over the railroad near Ridgeway being abandoned. Most of the other alignment options initially considered would only require a single crossing.

While Alignment Option 5B addresses the geometric deficiencies and inconsistencies, local and regional traffic would not be accommodated with this alignment option, including the primary regional through movements from the south and west of the study area. The anticipated design elements, including considerable infrastructure or anticipated right of way acquisition needed to cross the railway and creeks would also greatly increase the cost. Based on the Purpose and Need and other considerations described above, Alignment Option 5B was not considered to be prudent or practicable for further evaluation or future implementation. The agencies concurred with not carrying forward this alignment option for evaluation on March 13, 2019.

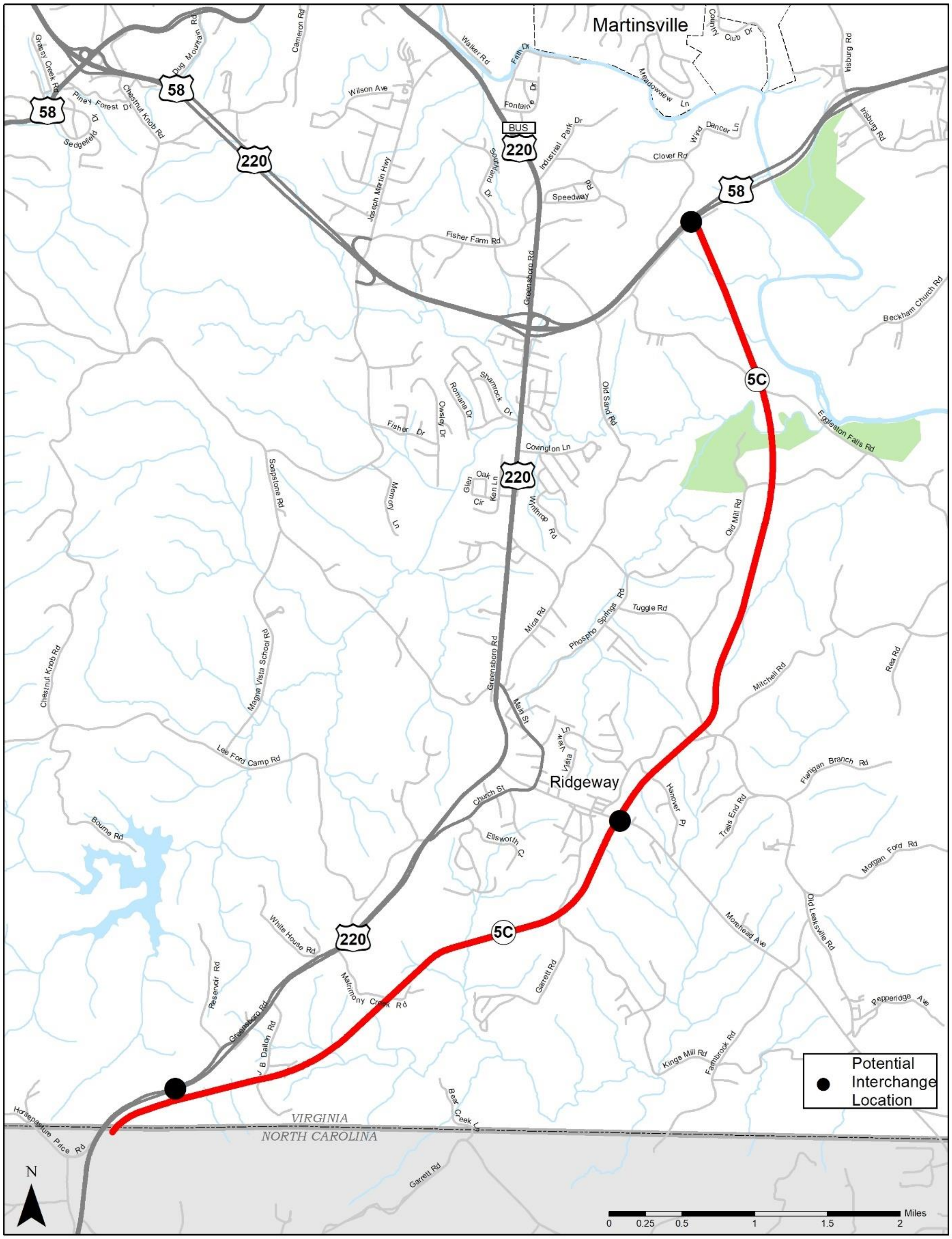
2.3.4 Alignment Option 5C

Alignment Option 5C, shown in **Figure 2-4**, would include reconstruction of existing Route 220 and the incorporation of access control, approximately nine miles long primarily on new alignment. Alignment Option 5C would reconstruct existing Route 220 alignment for 0.4 miles from the North Carolina state line. From its southern connection to existing Route 220, the alignment would proceed off the eastern side of existing Route 220 and continue in an easterly direction, paralleling Matrimony Creek. A segment of existing Route 220 would be realigned, and a new interchange would be constructed near the point where the new roadway would separate from the existing roadway. The alignment would cross J.B. Dalton Road and continue eastward for approximately one mile before turning northeasterly, crossing three minor tributaries and one larger tributary of Matrimony Creek, as well as Kings Mill Road. The alignment would then shift northward and follow a small ridge east of Surry Martin Branch before crossing Morehead Avenue near Colonnade Court. An interchange would be provided at Morehead Avenue. The alignment would pass east of Ridgeway to avoid impacting existing homes on Hanover Place, Old Leaksville Road, Old Mill Road, and Mitchell Road. From there, the alignment would continue northeasterly and cross two utility corridors to the east of an existing power substation. Alignment Option 5C would then proceed north and continue across Old Mill Road, crossing into Fisher Farm Park for approximately 0.3 miles. It would then cross Marrowbone Creek, Eggleston Falls Road, and two minor tributaries of the Smith River before tying in with Route 58 at the same location as Alignment Options 5A and 5B.

2.3.4.1 Accommodating Regional Traffic

Existing regional traffic patterns indicate that most of the travel is to and from the south and west of the study area. Nearly 85 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT 2020a). Of these trucks traveling through the study area, 81 percent continue to the west on Route 58. Of the trucks traveling eastbound on Route 58 into the study area, 66 percent continue through it without stopping and over two-thirds of them travel southbound on Route 220 to North Carolina. Future traffic forecasting suggests that these regional travel demand trends will remain relatively consistent in the 2040 design year.

Figure 2-4: Alignment Option 5C



In 2040, 78 percent of the trucks entering Route 220 from North Carolina are anticipated to represent regional through trips traveling through the study area without stopping. Similarly, 79 percent of trucks on Route 58 westbound from Route 220 are expected to be regional truck traffic in 2040, and 63 percent of the trucks traveling eastbound on Route 58 into the study area represent regional through trips.

Alignment Option 5C would benefit regional traffic by providing an access-controlled roadway from the North Carolina state line to Route 58 that would be free of traffic signals, cross streets, and driveways; however, the interchange located approximately 1.2 miles to the east of the current northern interchange at Route 58 would create a more circuitous route for the majority of the regional traffic that travels to and from the west and south, adding approximately six miles to the trip. Those traveling to and from the west and south might be inclined to use existing Route 220 instead of the new roadway due to its shorter distance and, as a result, shorter travel time. A trip on Alignment Option 5C would be over five miles longer than traveling on existing Route 220 for these drivers. Alignment Option 5C would provide a benefit to the regional traffic by diverting the traffic that currently travels to and from manufacturing centers in Eden, North Carolina and points south onto the new roadway, as opposed to using Morehead Avenue through Ridgeway. Traffic within Ridgeway would also benefit with reduced traffic congestion as a result of the regional traffic bypassing Morehead Avenue.

2.3.4.1 Accommodating Local Traffic

Alignment Option 5C would maintain most of existing Route 220 as it exists today. The only properties that would require access via frontage roads are along southbound Route 220, south of J.B. Dalton Road, as well as properties on J.B. Dalton Road that would be south of the new roadway. Residents and business owners to the north would access the roadway as they do under existing conditions. A detailed traffic analysis was not performed to determine how the frontage roads would function, as Alignment Option 5C was not carried forward for evaluation. Traffic volumes along existing Route 220 would decrease, which would likely result in a greater ability for drivers to enter Route 220 from side streets, reduced delays at intersections, and fewer crashes; however, most of the regional traffic that travels between points south and east of the study area would still use existing Route 220, as it would provide a direct through movement for regional traffic destined for points west and south of the study area.

2.3.4.2 Addressing Geometric Deficiencies and Inconsistencies

Seven of the 14 geometric deficiencies (three non-compliant roadway curves and 11 substandard stopping sight distances, identified in **Figure 1-7**) would be directly addressed in Alignment Option 5C, through reconstructing the Route 220 roadway and providing a new interchange on the southern end of the alignment. The number of motorists traveling in the southbound lanes on Route 220 would be reduced, as users of the existing southbound roadway who are traveling to and from points east of the study area would divert to the new alignment.

2.3.4.3 Other Considerations

Alignment Option 5C is one of the longest alignment options, adding additional anticipated costs. The location of the interchange at Morehead Avenue would impact several existing businesses and residences to the east of Ridgeway. The new roadway alignment would closely parallel Matrimony Creek for 0.8 miles, such that retaining walls or engineered slopes may be needed to minimize impacts to this resource. Alignment Option 5C passes through Fisher Farm Park, which is protected under Section 6(f) of the Land and Water Conservation Fund Act of 1963 (LWCF), for 0.3 miles; and passes within 1,000 feet of the athletic fields and facilities.

Alignment Option 5C would remove some of the geometric deficiencies in the existing corridor, but over half would remain on the southbound roadway. As a result of Alignment Option 5C only accommodating some of the regional traffic with limited benefits to local traffic, as well as the inability to address the geometric deficiencies on Route 220, Alignment Option 5C was not recommended to be carried forward for evaluation. The agencies concurred with the recommendation on March 13, 2019.

2.3.5 Alignment Option 5D

Alignment Option 5D, shown in **Figure 2-5**, would include the incorporation of an access-controlled, approximately ten-mile long roadway, located primarily on new alignment. Alignment Option 5D would be similar to Alignment Option 5C over much of its length, with the primary difference being the northern portion of the horizontal alignment and interchange location at Route 58. At the southern terminus, similar to Alignment Option 5C, Alignment Option 5D would deviate from Route 220 approximately 0.4 miles north of the North Carolina state line, proceeding in an easterly direction. A new interchange would be constructed to connect a realigned existing Route 220 to the new roadway. The alignment would cross J.B. Dalton Road and continue eastward for approximately one mile before turning northeasterly, crossing three minor tributaries and one larger tributary of Matrimony Creek, as well as Kings Mill Road. The alignment would then shift northward and follow a small ridge east of Surry Martin Branch before crossing Morehead Avenue near Colonnade Court. An interchange would be provided at Morehead Avenue. The alignment would deviate from Alignment Option 5C just south of Old Mill Road. From this location, Alignment Option 5D would cross Old Mill Road and proceed eastward behind existing homes on Old Mill Road, in a more easterly direction than Alignment Option 5C.

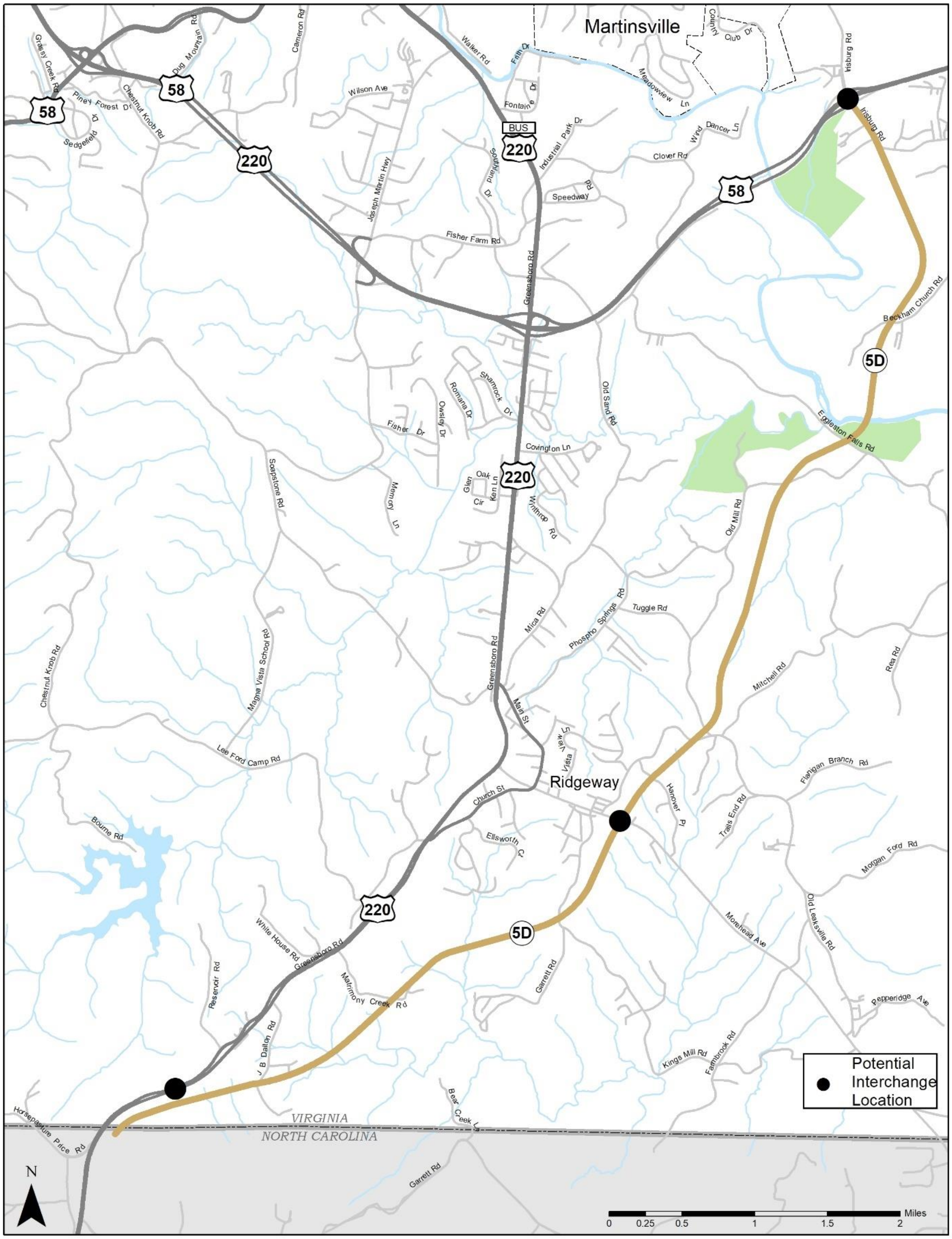
Alignment Option 5D would continue to proceed in an easterly direction, adjacent to Fisher Farm Park before crossing Eggleston Falls Road. This alignment would impact the Richard P. Gravely, Jr. Nature Preserve, with 0.4 miles of the alignment within the preserve, prior to crossing the Smith River. On the north side of the Smith River, the alignment would shift northeasterly crossing Beckham Church Road, then cross an existing utility easement twice before shifting northwesterly to meet Route 58 at the location of the existing interchange with Irisburg Road. The Irisburg Road interchange would be modified to provide a more direct connection between Route 58 and the new roadway, as well as reconnecting the two sides of Irisburg Road across Route 58.

2.3.5.1 Accommodating Regional Traffic

Existing regional traffic patterns indicate that most of the travel is to and from the south and west of the study area. Nearly 85 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks traveling through the study area, 81 percent continue to the west on Route 58. Of the trucks traveling eastbound on Route 58 into the study area, 66 percent of the trucks traveling eastbound on Route 58 into the study area continue through without stopping and over two-thirds of them travel southbound on Route 220 to North Carolina. Future traffic forecasting suggests that these regional through travel demand trends will remain relatively consistent in the 2040 design year. In 2040, 78 percent of the trucks entering Route 220 from North Carolina are anticipated to represent regional through trips traveling through the study area without stopping. Similarly, 79 percent of trucks on Route 58 westbound from Route 220 are expected to be through regional truck traffic in 2040; and 63 percent of the trucks traveling eastbound on Route 58 into the study area represent regional trips.

Alignment Option 5D would benefit regional traffic by providing an access-controlled facility from the North Carolina state line to Route 58 that would be free of traffic signals, cross streets, and driveways; however, the interchange located approximately three miles to the east of the current northern interchange of Route 220 and Route 58. The interchange of Alignment Option 5D would create a more circuitous route for most of the regional traffic that travels to and from the west and south. Those traveling to and from the west and south might be inclined to use Route 220 instead of the new roadway due to its shorter distance and travel time. A trip on Alignment Option 5D would be over eight miles longer than traveling on existing Route 220 for these regional drivers.

Figure 2-5: Alignment Option 5D



Alignment Option 5D would provide a benefit to the regional traffic by diverting the traffic that currently travels to and from manufacturing centers in Eden, North Carolina and points south onto the new roadway, as opposed to using Morehead Avenue through Ridgeway. Traffic within Ridgeway would also benefit from reduced traffic congestion resulting from the regional traffic bypassing Morehead Avenue.

2.3.5.2 Accommodating Local Traffic

Alignment Option 5D would maintain most of Route 220 as it exists today. The only properties that would require access via frontage roads are along southbound Route 220, south of J.B. Dalton Road, as well as properties on J.B. Dalton Road that would be south of the new roadway. Residents and business owners to the north would access the roadway as they do today.

Traffic volumes along Route 220 would decrease, which would likely result in a greater ability for drivers to enter Route 220 from side streets, reduce delays at intersections, and fewer crashes; however, most of the regional traffic that travels between points south and west of the study area would still use Route 220.

2.3.5.3 Addressing Geometric Deficiencies and Inconsistencies

Seven of the 14 geometric deficiencies (see **Figure 1-7**) would be directly addressed in Alignment Option 5D, through reconstructing the Route 220 roadway and providing a new interchange on the southern end of the alignment. The number of motorists traveling in the existing southbound lanes on Route 220 would be expected to decline, as users of the existing southbound roadway who are traveling to and from points east of the study area would be expected to divert to the new alignment.

2.3.5.4 Other Considerations

Alignment Option 5D is the longest of all the alignments located to the west, adding additional cost. In addition, Alignment Option 5D would directly impact publicly owned parks: the alignment would be adjacent to the Smith River Sports Complex but proceed through the Richard P. Gravely, Jr. Nature Preserve where there are trails and river access. The Smith River is designated as Special Regulation Brown Trout Water at the location of the potential crossing (VDGIF 2019a) and would require a 600-800-foot long bridge adding to the overall project cost.

When given the option of using the new roadway or the existing one, based on existing and forecasted future traffic patterns, the primary regional traffic movements traveling from the south and west ends of the study area would likely use the existing roadway. An eastern alignment option would create a more circuitous route for the majority of the regional traffic that travels to and from the west and south. Those traveling to and from the west and south might be inclined to use Route 220 instead of the new roadway due to its shorter distance and travel time. As a result, Alignment Option 5D would only improve traffic movements for regional through traffic traveling between the southern and eastern project limits (VDOT, 2020a). This is contrary to the Purpose and Need to accommodate regional traffic, as most of the traffic travels to and from the south and west. Local traffic would not be accommodated, considering that the majority of the regional traffic would remain on the existing roadway.

Alignment Option 5D was not carried forward primarily because it would not accommodate regional or local traffic. The only regional traffic movements captured are from Morehead Avenue and the traffic traveling between the south and east. The majority of the traffic travels between the southern and the western boundaries of the study area. The small volume of traffic diverted from Route 220 would not separate regional traffic from local traffic, and therefore does not meet the Purpose and Need. The agencies concurred with not carrying forward this alignment option for evaluation on March 13, 2019.

2.3.6 Multimodal Alignment Options

2.3.6.1 Mass Transit Improvements

There is currently one mass transit service within the study area, the Piedmont Area Regional Transit (PART) shuttle service that serves Martinsville. The PART Southside Route serves the northernmost reaches of the study area, following a clockwise route every hour down Greensboro Road to a stop at Tractor Supply, then following Fisher Farm Road westward to a stop at DDI Logistics before turning northward on Joseph Martin Highway (WPPDC, 2017). However, within the study area transit services are not provided on existing Route 220 south of Route 58. There are currently no plans to expand the PART shuttle service south of Route 58 in the Henry County or West Piedmont Planning District Commission (WPPDC) long-range planning documents (WPPDC, 2017). Typically, Mass Transit would be considered a viable alternative in urban areas with populations over 200,000 (FHWA, 1987). Although the study area is considered urban (designated as growth areas), the current resident population within the study area is 7,849, while Henry County's resident population is 52,209 (see **Chapter 3: Affected Environment and Environmental Consequences** and the ***Socioeconomic and Land Use Technical Report*** [VDOT, 2020c]). As a standalone option, the Mass Transit Improvements would not satisfy the project's Purpose and Need as it would not eliminate or reduce conflict between regional and local traffic nor would it address current geometric deficiencies and inconsistencies on Route 220. Therefore, it was not carried forward for detailed evaluation. However, the NEPA process does not preclude transit strategies from being implemented as part of a separate project in the future.

2.3.6.2 Non-Motorized Improvements

Improvements for non-motorized modes of transportation (e.g., bicycling, walking) do not satisfy the study's Purpose and Need. Therefore, non-motorized improvements were not carried forward for detailed evaluation. Several of the evaluated alignments would reduce the amount of traffic using Route 220, providing greater opportunities for east-west access as well as non-motorized facilities parallel to the roadway. The NEPA process does not preclude implementing these strategies as part of a separate project in the future.

2.4 ALTERNATIVES CARRIED FORWARD FOR EVALUATION

Upon receiving agency concurrence on the range of alternatives, VDOT began preliminary engineering analyses and initial evaluations of the options listed below, which were formally identified as alternatives to be carried forward for potential evaluation in the Draft EIS and were renamed as follows. The identification and evaluation of a reasonable range of alternatives is consistent with FHWA's Technical Advisory *T6640.8A Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA 1987).

- No-Build Alternative – previously named Alignment Option 1
- Alternative A – previously named Alignment Option 4A
- Alternative B – previously named Alignment Option 4B
- Alternative C – previously named Alignment Option 4C[18]
- Alternative D – previously named Alignment Option 4D
- Alternative E – previously named Alignment Option 3

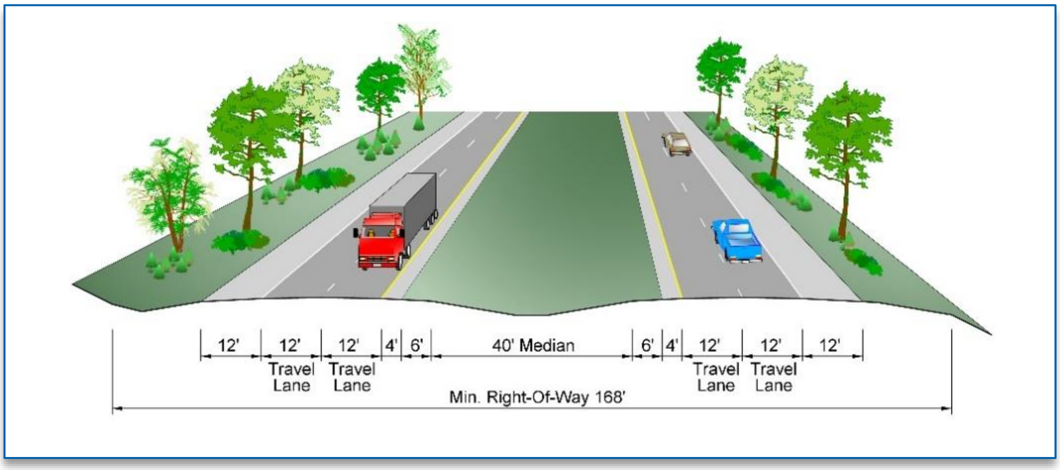
[18] See **Section 2.2,** modifications were considered to Alignment Option 4C; as a result, it also was recommended to be carried forward for evaluation.

2.4.1 Design Criteria and Typical Sections

Planning level engineering assumptions were developed for each alternative using current design standards adopted by VDOT, including American Association of State Highway Transportation Official's (AASHTO) *A Policy on Geometric Design of Highways and Streets, 2011* (Green Book) and the VDOT Road Design Manual (AASHTO, 2011 and VDOT, 2018a). Detailed tables showing the design criteria that were used for this study are included in the ***Alternatives Analysis Technical Report*** (VDOT, 2020b)[19]. The design criteria as well as the cost and impact assumptions presented in this Draft EIS are based on the functional classification of the new roadway as a Rural Principal Arterial (GS-1) with a design speed of 60 mph.

Based on the established design criteria, roadway typical sections were developed and applied to each alternative, depending on the location of the improvements under consideration (i.e. reconstruction with full access control along existing Route 220 or a full access control facility on new location). Where the alternatives would potentially include improvements on new location, the typical section illustrated in **Figure 2-6** was applied. The typical section is a divided highway that has a 40-foot wide median, with 40 feet of pavement on each side. The 40-foot wide median is consistent with both VDOT and AASHTO guidelines for median width. The Green Book notes that, "When medians are 40 ft [12 m] or wider, drivers have a sense of separation from opposing traffic; thus, a desirable ease and freedom of operation is obtained, the noise and air pressure of opposing traffic is not noticeable, and the glare of headlights at night is greatly reduced" (AASHTO, 2011). The paved section in each direction consists of a four-foot wide inside shoulder, two 12-foot travel lanes, and a 12-foot wide outside shoulder. Beyond the outside shoulders is a buffer space needed for a design speed of 60 mph. For the purposes of assessing impacts, a 2:1 side slope was utilized beyond the required drainage swales.

Figure 2-6: Typical Section – New Location Alignment

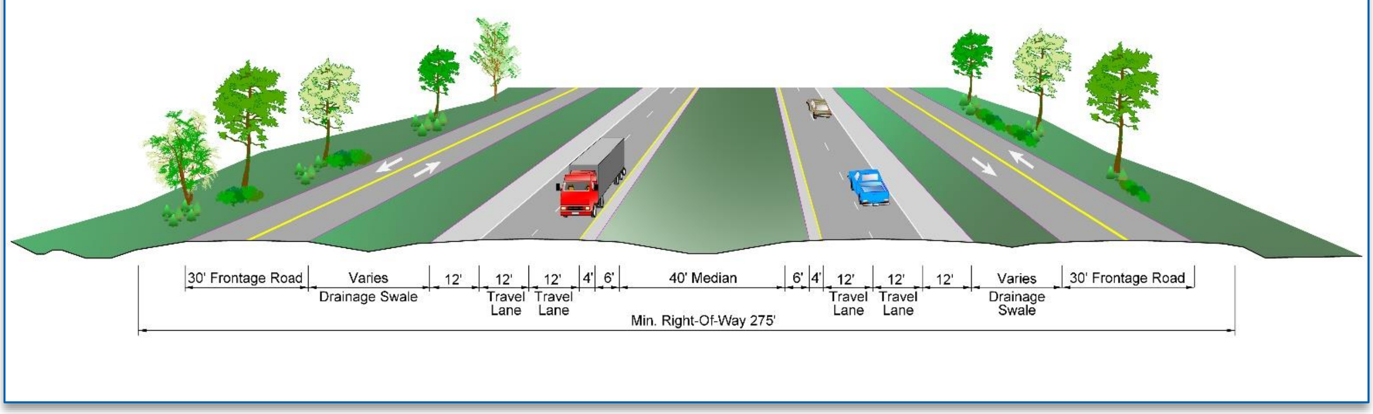


For locations in which frontage roads would be required, the typical sections for the alignment options are shown in **Figure 2-7**. Frontage roads are associated with reconstruction considered along existing Route 220. The typical sections assume open drainage using swales, therefore,

[19] Planning level engineering assumptions that were developed and used for this study are based on the functional classification of the roadway as a Rural Principal Arterial (GS-1) with a design speed of 60 mph. These are assumptions and not NEPA commitments. If it is determined that there is a need to change or refine any of assumptions as part of advanced engineering and design on any improvements advanced from this study, then additional analysis and documentation may be required.

minimization options such as concrete barrier are not included in the illustrative planning levels designs presented in this Draft EIS.

Figure 2-7: Typical Section – Reconstruction of Existing Route 220 with Frontage Roads



2.4.2 Planning Level Limit of Disturbance

Based on the established design criteria and typical sections, an illustrative planning level LOD was developed to estimate the potential impacts of each alternative carried forward for evaluation in this Draft EIS. The LOD has been developed based on the horizontal alignment, vertical profile and typical sections for each of the alternatives carried forward for evaluation. The LOD uses engineered roadway alignments, includes drainage and stormwater needs, and is developed using the recommended roadway grades. The LOD assumes the worst-case scenario for the calculation of impacts and costs[20]. The LOD for evaluated interchanges have been preliminarily determined based on the anticipated traffic volumes and types of connections (i.e. service interchange to lower-order functional class roadway or system interchange to arterial facility or higher-order functionally classified roadway). The LOD within the interchange areas has been established to conceptualize how the alternatives under evaluation would tie into existing roadway facilities and for the purposes of estimating potential impacts to environmental and human resources. Should any improvements from the Martinsville Southern Connector Study advance for detailed engineering and design, refinements to the interchange configurations and LOD would be evaluated to maximize the operational efficiency of the connection and to avoid or minimize impacts to the greatest extent practicable. Additional information on the typical section and LOD used for this study are included in the ***Alternatives Analysis Technical Report*** (VDOT, 2020b).

The planning level design and LOD assumes that all bridges over the Norfolk Southern railroad are constructed such that abutments are located outside of the railroad right of way, with an assumed minimum under clearance from top of rail to bottom of overhead structure of 23 feet[21]. Where the alternatives cross over a feature (e.g., railway, roadway, waterway), bridges are

[20] The illustrative planning level LOD does not consider final sign placement, soundwall design, or drainage features. While these features may extend beyond the LOD, the estimates presented in the Draft EIS still capture a worst-case impact scenario. If it is determined that features extend beyond the LOD as part of advanced engineering and design of any improvements advanced from this study, then additional analysis and documentation may be required.

[21] Minimum vertical clearance acceptable for roadway sections crossing the Norfolk Southern Roadway, per VDOT's *Manual of the Structures and Bridge Division*, File No. 06.06-4 (VDOT, 2013).

assumed to be two 44-foot wide structures, one for the northbound and one for the southbound direction. Bridges where adjacent roadways cross over a potential alternative are assumed to be a single structure. All waterway crossings with a 100-year floodplain are assumed to be bridges for cost estimate purposes, whereas other crossings are assumed to be culverts with fills unless otherwise noted in the cost estimate. Roadway profiles were developed such that there is at least ten feet of vertical clearance between the roadway surface and all stream crossings[22]. Additional structural details and specific dimensions would be determined during more detailed design if any improvements should advance from the Martinsville Southern Connector Study.

The LOD varies throughout the corridor due to the presence of considerable cuts and fills. Roadway profiles were developed using the continuous typical sections shown in **Figure 2-6** and **2-7**.

The terrain within the study area is rolling and dominated by igneous and metamorphic rock, consistent with the geology of the Piedmont Physiographic Province in this region. As a result, there is a high likelihood of rock very near the surface. For the development of the LOD and cost estimates for each alternative, 6:1 slopes are assumed to be located at the edge of the required clear zone – or the width of the recoverable area along the roadway edge – for each roadway section. Drainage swales are assumed to have 3:1 slopes with flat bottoms ranging from two to 10 feet in width. Cut slopes and fill slopes to tie in with existing ground beyond the drainage swales are assumed to be 2:1 for all roadways. The 2:1 cut slopes, coupled with the roadside drainage area and wide clear zones, may eliminate the need for additional rockfall protection adjacent to the roadway. For each alternative, roadway cuts greater than 50 feet in height have been identified as potential locations for additional rockfall protection in the cost estimates.

For each of the alternatives evaluated, work is anticipated on segments of crossing and intersecting streets. The latest design criteria were used for the reconstruction of these roadways and are included within the LOD. Typical sections for rebuilt segments of other impacted roadways within the study area are based on the latest pavement widths, roadside grading, and design criteria that are required for their functional classifications in the VDOT *Road Design Manual* (VDOT, 2011).

2.4.3 Alternatives Retained

2.4.3.1 No-Build Alternative

In accordance with the regulations for implementing NEPA [40 CFR §1502.14(d)], the No-Build Alternative has been included for evaluation as a basis for the comparison of future conditions and impacts. The No-Build Alternative would retain the Route 220 roadway and associated intersections and interchanges in their present configuration, allowing for routine maintenance and safety upgrades.

This alternative assumes no major improvements within the study area, except for previously committed projects that are programmed and funded in VDOT's *SYIP for FY 2020-2025* (VDOT, 2019a) and Henry County's *Budget for FY 2019-2020* (County of Henry, 2019). As these other projects are independent of the evaluated alternatives, they are not evaluated in this Draft EIS.

[22] Planning level engineering assumptions that were developed and used for this study are based on the functional classification of the roadway as a Rural Principal Arterial (GS-1). These are assumptions and not NEPA commitments. If it is determined that there is a need to change or refine any of the assumptions as part of advanced engineering and design on any improvements advanced from this study, then additional analysis and documentation may be required.

Traffic Operations

This alternative would not improve mobility for local traffic and trucks to travel within the Route 220 corridor and adjacent roadways. Delays at existing signalized intersections would continue to increase and the non-recurring congestion due to crashes is anticipated to either remain the same or increase. According to AASHTO guidelines, "the frequency of traffic crashes on particular highway facilities is very strongly influenced by the traffic volumes present. Crash frequencies generally increase with increasing traffic volumes, but this effect is generally nonlinear" (AASHTO, 2011). Consequently, under future conditions, if no additional improvements are made within study area, anticipated mobility issues would likely increase the potential for crashes along Route 220 which could increasingly lead to unexpected congestion due to the limited abilities for vehicles to bypass incidents.

Ability of the No-Build Alternative to Address the Purpose and Need

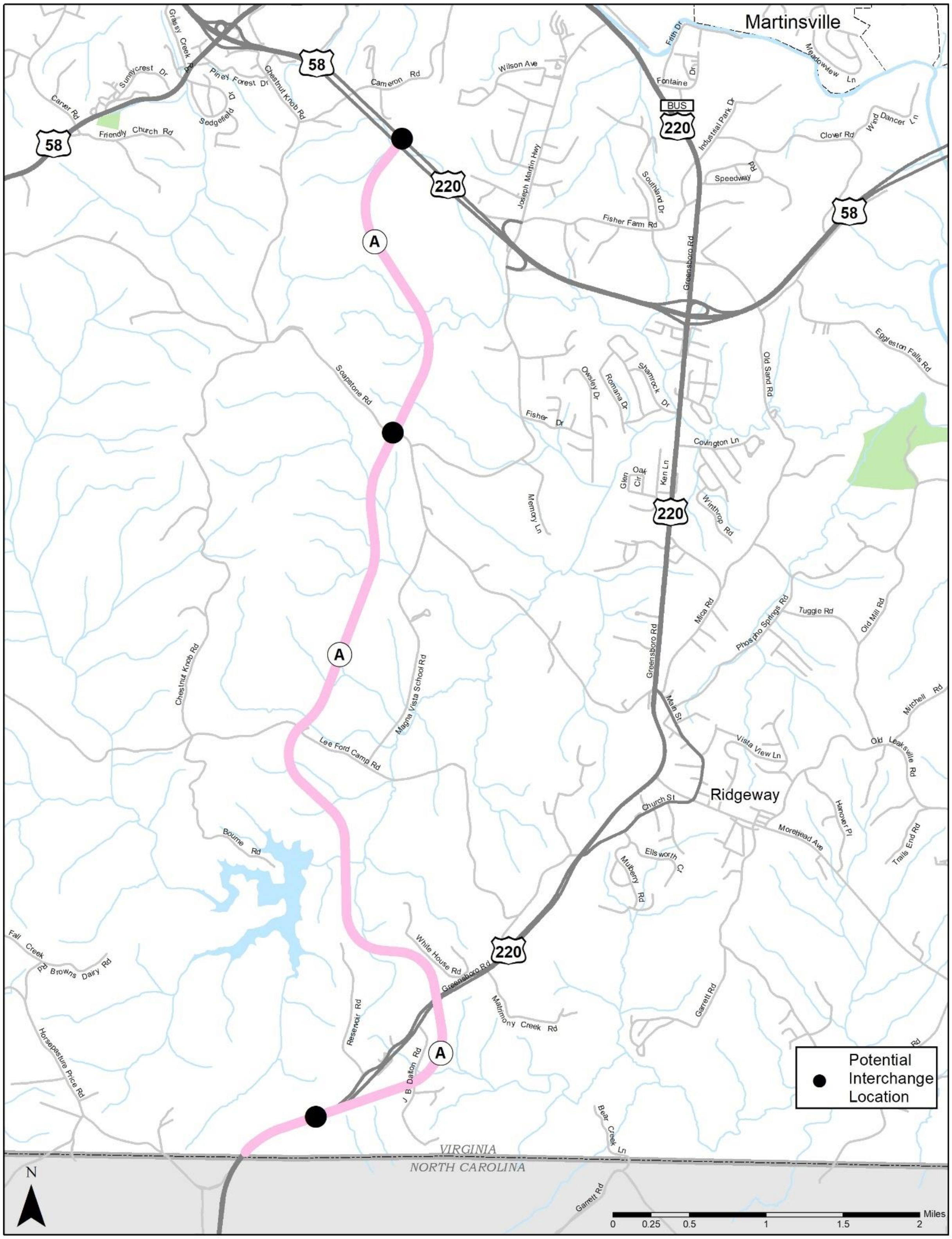
The No-Build Alternative would not address the Purpose and Need elements, as identified in **Section 1.3**, because routine maintenance and other programmed projects would not provide improved mobility for regional traffic, enhanced access for local traffic, or improvements to existing geometric deficiencies and inconsistencies.

2.4.3.2 Alternative A

Alternative A, shown in **Figure 2-8**, would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative A, access would be controlled and provided at three new interchanges. It is assumed that interchanges would be provided at both ends of the facility and one would be located along the corridor. For the purposes of the analyses in this Draft EIS, it is assumed this third interchange would occur at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative A would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad. The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest crossing Patterson Branch. The alignment would then shift to the north, following a small ridge between Patterson Branch and a tributary to Marrowbone Creek, before crossing Marrowbone Creek east of Marrowbone Dam. The alignment would continue north and to the west of a large farm/open field, crossing tributaries of Marrowbone Creek. The alignment would shift eastward and cross over Lee Ford Camp Road, Stillhouse Run, and a floodplain. After crossing Stillhouse Run, the alignment would shift northward and continue for approximately one mile. The alignment would then continue north reaching Soapstone Road, where a new interchange would be provided, west of the intersection with Joseph Martin Highway. The alignment would then turn to the northeast to cross three minor tributaries to Marrowbone Creek. The alignment continues in a northerly direction with a new interchange at Route 58, west of the interchange at Joseph Martin Highway.

Figure 2-8: Alternative A



Traffic Operations

Alternative A would improve traffic flow by providing an efficient north-south connection for regional traffic between the North Carolina state line and Route 58. Route 220 is identified as a CoSS in *VTrans 2040* and is identified as an important freight route to support the region's economy (OIPI, 2015 and WPPDC, 2013). By diverting the regional traffic to an access-controlled facility, while maintaining existing Route 220 as a local business route, Alternative A would reduce travel times for most of the regional traffic while improving access for local traffic that currently uses Route 220. The three new interchanges would support the mobility of regional traffic into and out of the study area.

The direct access configurations on existing Route 220 would remain the same for most of those living and working along the roadway. The only changes would occur in the southern part of the Route 220 corridor where access control would be implemented as part of the reconstruction of the existing facility. Along this segment, residents along northbound Route 220 would no longer have direct access to the roadway. Access would be provided by parallel frontage roads that connect to the southern interchange. Residents along J.B. Dalton Road south of the new roadway would access Alternative A from this new frontage road.

Although the access for local residents and businesses along existing Route 220 would remain generally consistent with current configurations, Alternative A would divert 12,200 average annual daily trips of the north-to-south regional vehicle trips onto the new access-controlled roadway, based on the 2040 forecasts. The regional through trips that would remain on Route 220 are part of the traffic that travels between the southern and eastern limits of the study area, as well as the traffic traveling on Morehead Avenue. As a result, overall delays would be reduced on Route 220. More detailed information on traffic data and analysis is documented in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

Ability of Alternative A to Address the Purpose and Need

Accommodating Regional Traffic

Under the No-Build Alternative, up to 31,900 vehicles are anticipated to travel along Route 220 within the study area in the year 2040. With the construction of Alternative A, the volume is anticipated to decrease to 22,000 vehicles. Under the 2040 forecasted traffic, Alternative A would carry up to 12,200 vehicles (VDOT, 2020a). Existing regional traffic patterns indicate that the majority of travel is to and from the south and west of the study area. Nearly 84 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks that are traveling through the study area, 75 percent continue to the west on Route 58. Of the trucks traveling westbound on Route 58 into the study area, 68 percent continue through it without stopping, and nearly two-thirds of them travel southbound on Route 220 to North Carolina, therefore a large portion of these trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative A[23].

[23] Travel patterns and forecasted travel demand have been estimated based on study-specific subarea travel demand model, developed and calibrated consistent with VDOT's *Travel Demand Modeling Policies and Procedures* as well as the methods described in the National Cooperative Highway Research Program's (NCHRP) Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (VDOT, 2014 and TRB, 2014). Detailed discussions of the methods and findings of the travel demand modeling conducted for this study can be found in the ***Traffic and Transportation Technical Report*** (VDOT, 2019a). Final design-level traffic engineering and analysis would be conducted as part of advanced engineering and design on any improvements that advance from this study.

Under Alternative A, truck volumes on existing Route 220 would be reduced by approximately 37 percent compared to the 2040 truck volumes under the No-Build Alternative. Compared to 2040 No-Build conditions, simulated average travel times under Alternative A would improve along the existing alignment in the northbound direction (13 percent and nine percent faster in the AM and PM peak period, respectively). Travel times would be 36 percent faster in the AM peak period and 29 percent faster in the PM peak period along the new alignment between the North Carolina state line and Route 58 compared to predicted travel times along existing Route 220 under the No-Build Alternative, thus improving regional traffic movements. Additional travel time information and operational analyses are included in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

Accommodating Local Traffic
Alternative A would carry up to 12,200 vehicles by 2040, resulting in the removal of 9,900 vehicles from existing Route 220, a reduction of approximately 31 percent compared to the No-Build Alternative (VDOT 2020a). The lower traffic volumes on existing Route 220 would reduce delays at signalized intersections and would increase the number of gaps available for drivers on side streets to exit onto the roadway facility. The reduced regional traffic on existing Route 220 would potentially result in a decrease in crash rates. Alternative A would result in a minimal reduction in travel time along existing Route 220, when compared to the No-Build Alternative. However, while travel times along existing Route 220 under Alternative A would remain generally consistent compared to No-Build conditions, the change in traffic composition with regional traffic shifting to the new alignment would improve local traffic movements (VDOT 2020a).

As previously mentioned, a large portion of trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative A. According to AASHTO guidelines, "trucks have a greater individual effect on highway traffic operation than do passenger vehicles. The effect on traffic operation of one truck is often equivalent to several passenger cars. The number of equivalent passenger cars equaling the effect of one truck is dependent on the roadway gradient and, for two-lane highways, on the available passing sight distance. Thus, the larger the proportion of trucks in a traffic stream, the greater the equivalent traffic demand and the greater the highway capacity needed" (AASHTO, 2011). Therefore, the reduction of trucks in the traffic system under Alternative A would decrease the potential for severe crashes and increase local connectivity by improving traffic operations on existing Route 220.

Alternative A would result in improvements to overall intersection delay on existing Route 220. As an example, the Soapstone Road/Main Street intersection currently (2018) has an overall delay during the morning peak of 29 seconds and an overall delay of 45 seconds in the afternoon peak hour. In 2040, with Alternative A constructed, the overall forecasted delay would be the same 29 seconds in the morning, but reduces to 33 seconds in the afternoon – a reduction of 25 percent (VDOT, 2020a). This simulated delay may be further reduced or vary slightly depending on actual travel conditions and driver decisions and behavior.

Addressing Geometric Deficiencies and Inconsistencies
Under Alternative A, the new roadway alignment would be constructed to meet current design standards. The southernmost portion under Alternative A, (approximately 1.7 miles) of existing Route 220 would be reconstructed, which would bring the horizontal and vertical curves up to current design standards in this section, and address the majority of the geometric deficiencies identified in this segment of existing Route 220. Two instances of substandard stopping sight distance and radii on the southbound approach to the new southern interchange are not addressed with this alternative alignment; however, these could possibly be addressed during detailed design. While allowing these deficiencies to remain is undesirable, a mitigating factor is the reduction in the number of vehicles traveling this segment of the corridor. Currently, approximately 6,000 vehicles travel southbound from Ridgeway toward the North Carolina state

line on Route 220 each day. With the construction of Alternative A, the forecasted volume using the southbound roadway in 2040 would be less than 4,000 (VDOT, 2020a).

Alternative A, as well as segments of existing roadways (e.g., Soapstone Road) that are included in the interchange or adjacent work, would be built to the latest VDOT design standards. This would reduce both the overall lane miles of substandard elements as well as the volume of drivers traversing roadway segments that are non-conforming.

Other Considerations

The total estimated cost of Alternative A is $757,340,000; more detail is provided in **Section 2.6**. Several elements are unique to the Alternative A alignment and deserve further consideration. In accordance with VDOT standards, Alternative A would cross over the Norfolk Southern railroad with a minimum clearance of 23 feet between the top of the rails and bottom of the roadway structure[24]. Route 220 and the railway follow along a ridge between the Matrimony Creek and Marrowbone Creek watersheds in this area. In some areas, the new roadway would be between 40-50 feet above existing ground; for estimating purposes, it was assumed that this would be a fill material and not a structure.

Much of Alternative A is aligned to follow along the eastern edge of the foothills near Chestnut Knob. There is a high likelihood of rock immediately below the surface. As Alternative A approaches the new interchange at Route 58 from the south, there is an existing ridge that would require rock removal for the roadway. Alternative A crosses over two existing utility easements for high tension lines and there is a third easement proposed for a new power line connection to Commonwealth Crossing Business Centre. These unique conditions have been considered in the planning level cost estimate for Alternative A; however, a full understanding of these constraints and cost implications would be developed as part of more detailed design for this alternative.

Table 2-3 summarizes the impacts associated with Alternative A. More detailed environmental information can be found in **Chapter 3: Affected Environment and Environmental Consequences**.

Table 2-3: Impacts Summary – Alternative A

Resource	Impacts
Potential Residential Relocations	17
Potential Commercial Relocations	0
Other Potential Relocations*	1
Streams (Linear Feet)	28,998
Wetlands (Acres)	7.8
Forest (Acres)	318
Historic Sties (Number of Properties)**	4

*Includes: Industrial, Institutional, and Cemeteries
**Number of properties on or eligible for listing on the National Register of Historic Places (NRHP)

[24] Minimum vertical clearance acceptable for roadway sections crossing the Norfolk Southern Roadway, per VDOT's *Manual of the Structures and Bridge Division*, File No. 06.06-4 (VDOT, 2013).

2.4.3.3 Alternative B

Alternative B, shown in **Figure 2-9**, would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative B, access would be controlled and provided at two new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. For the purposes of the analyses in this Draft EIS it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

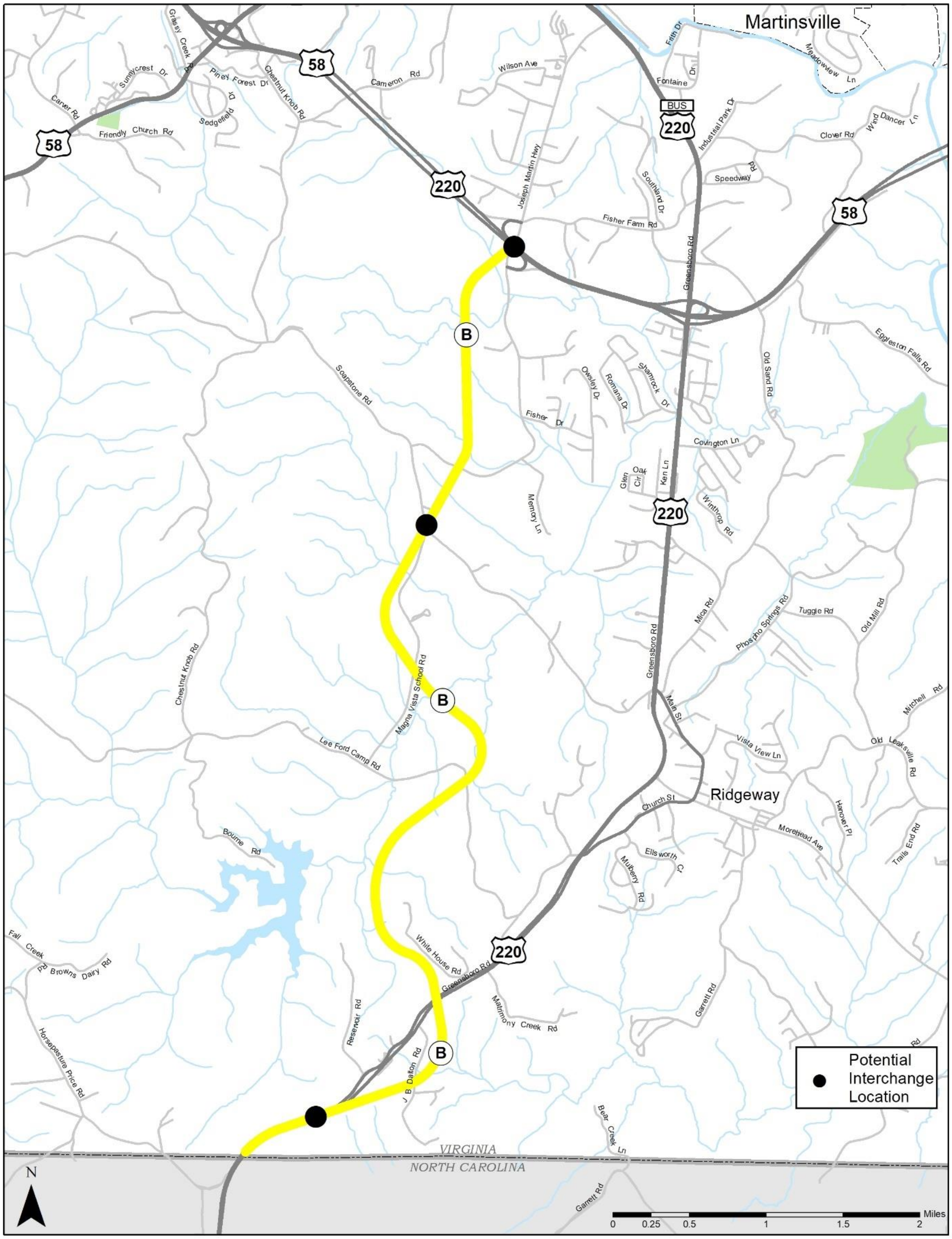
Beginning at the North Carolina state line, Alternative B would reconstruct Route 220 for approximately one mile, where it would shift eastward before turning to the north to cross over the Norfolk Southern railroad. The wide horizontal curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, as well as minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest prior to crossing Patterson Branch. The alignment would then gradually shift from the northwest to the northeast and cross three tributaries to Marrowbone Creek. The alignment would continue in a northeasterly direction over Lee Ford Camp Road, where it would pass to the east of the Marrowbone Plantation, shifting northwest to cross Marrowbone Creek. After crossing Marrowbone Creek, Alternative B would continue to the northwest, crossing Magna Vista School Road south of Magna Vista High School, then paralleling Magna Vista School Road west of the high school up to an new interchange with Soapstone Road. The new interchange at Soapstone Road would require the relocation of a portion of Magna Vista School Road. From the Soapstone Road interchange, the alignment would continue to the northeast and cross two minor tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at its interchange with Route 58, requiring modifications to the existing interchange configuration to provide a more direct connection between Route 58 and the new roadway. The reconstructed portion of Route 220 at the southern end, along with the new alignment, would be an access-controlled facility.

<u>Traffic Operations</u>

Alternative B would improve traffic flow by providing an efficient north-south connection for regional traffic between the North Carolina state line and Route 58. Route 220 is identified as a CoSS in *VTrans 2040* and is identified as an important freight route to support the region's economy (OIPI, 2015 and WPPDC, 2013). By diverting the regional traffic to an access-controlled facility while maintaining existing Route 220 as a local business route, Alternative B would reduce travel times for most of the regional traffic while improving access for local traffic that currently uses Route 220. The two new interchanges on the new roadway, as well as the reconfigured interchange at Route 58, would support the mobility of regional traffic into and out of the study area.

The direct access configurations on existing Route 220 would remain the same for most of the population living and working along the roadway. The only changes would occur in the southern part of the Route 220 corridor where access control would be implemented as part of the reconstruction of the existing facility. Along this segment, residents along northbound Route 220 would no longer have direct access to the roadway. Access would be provided by a parallel frontage road that connects to the southern interchange. Residents along J.B. Dalton Road south of the new roadway would access Alternative B from this new frontage road.

Figure 2-9: Alternative B



Although the access for local residents and businesses along existing Route 220 would remain generally consistent with current configurations, Alternative B would divert 12,800 average annual daily trips of the north-to-south regional vehicle trips onto the new access-controlled roadway, based on the 2040 forecasts. The regional through trips that would remain on Route 220 are part of the traffic that travels between the southern and eastern limits of the study area, as well as the traffic traveling on Morehead Avenue. As a result, overall delays would be reduced on Route 220. More detailed information on traffic data and analysis is documented in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

<u>Ability of Alternative B to Address the Purpose and Need</u>

<u>Accommodating Regional Traffic</u>

Under the No-Build Alternative, up to 31,900 vehicles are anticipated to travel along Route 220 within the study area in the year 2040. With the construction of Alternative B, the volume is anticipated to decrease to 22,000 vehicles. Under the 2040 forecasted traffic, Alternative B would carry up to 12,800 vehicles (VDOT, 2020a). Existing regional traffic patterns indicate that the majority of the travel is to and from the south and west of the study area. Nearly 84 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks that are traveling through the study area, 75 percent continue to the west on Route 58. Of the trucks traveling westbound on Route 58 into the study area, 68 percent continue through it without stopping and nearly two-thirds of them travel southbound on Route 220 to North Carolina, therefore, a large portion of these trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative B[25].

Under Alternative B, truck volumes on existing Route 220 would be reduced by approximately 40 percent compared to the 2040 truck volumes under the No-Build Alternative. Compared to 2040 No-Build conditions, simulated average travel times under Alternative B would improve along the existing alignment in the northbound direction (15 percent and two percent faster in the AM and PM peak period, respectively). Travel times would be 27 percent faster in the AM peak period and 22 percent faster in the PM peak period along the new alignment between the North Carolina state line and Route 58 compared to predicted travel times along existing Route 220 under the No-Build Alternative, thus improving regional traffic movements. Additional travel time information and operational analyses are included in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

<u>Accommodating Local Traffic</u>

Alternative B would carry up to 12,800 vehicles by 2040, resulting in the removal of 9,900 vehicles from the existing Route 220, a reduction of approximately 31 percent compared to the No-Build Alternative (VDOT 2020a). The lower traffic volumes on existing Route 220 would reduce delays at signalized intersections and would increase the number of gaps available for drivers on side streets to exit onto the roadway facility. The reduced regional traffic on the existing Route 220 would potentially result in a decrease in crash rates. Alternative B would result in a minimal

[25] Travel patterns and forecasted travel demand have been estimated based on study-specific subarea travel demand model, developed and calibrated consistent with VDOT's *Travel Demand Modeling Policies and Procedures* as well as the methods described in the NCHRP Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (VDOT, 2014 and TRB, 2014). Detailed discussions of the methods and findings of the travel demand modeling conducted for this study can be found in the ***Traffic and Transportation Technical Report*** (VDOT, 2019a). Final design-level traffic engineering and analysis would be conducted as part of advanced engineering and design on any improvements that advance from this study.

reduction in travel time along existing Route 220, when compared to the No-Build Alternative. However, while travel times along existing Route 220 under Alternative B would remain generally consistent compared to No-Build conditions, the change in traffic composition with regional traffic shifting to the new alignment would improve local traffic movements (VDOT 2020a).

As previously mentioned, a large portion of trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative B. According to AASHTO guidelines, "trucks have a greater individual effect on highway traffic operation than do passenger vehicles. The effect on traffic operation of one truck is often equivalent to several passenger cars. The number of equivalent passenger cars equaling the effect of one truck is dependent on the roadway gradient and, for two-lane highways, on the available passing sight distance. Thus, the larger the proportion of trucks in a traffic stream, the greater the equivalent traffic demand and the greater the highway capacity needed" (AASHTO, 2011). Therefore, the reduction of trucks in the traffic system under Alternative B would decrease the potential for severe crashes and increase local connectivity by improving traffic operations on existing Route 220.

Alternative B would result in improvements to overall intersection delay on existing Route 220. As an example, the Soapstone Road/Main Street intersection currently (2018) has an overall delay during the morning peak of 29 seconds and an overall delay of 45 seconds in the afternoon peak hour. In 2040, with Alternative B constructed, the overall delay reduces to 14 seconds in the morning and reduces to 31 seconds in the afternoon – a reduction of over 50 percent in the morning and 30 percent in the afternoon (VDOT, 2020a). This simulated delay may be further reduced or vary slightly depending on actual travel conditions and driver decisions and behavior.

Addressing Geometric Deficiencies and Inconsistencies
Under Alternative B, the new roadway alignment would be constructed to meet current design standards. The southernmost portion under Alternative B, (approximately 1.7 miles) of existing Route 220 would be reconstructed, which would bring the horizontal and vertical curves up to current design standards in this section and would address the majority of the geometric deficiencies identified in this segment of existing Route 220. Two instances of substandard stopping sight distances and radii on the southbound approach to the new southern interchange are not addressed with this alternative alignment; however, these could possibly be addressed during detailed design. While allowing these deficiencies to remain is undesirable, a mitigating factor is the reduction in the number of vehicles traveling this segment of the corridor. Currently, approximately 6,000 vehicles travel southbound from Ridgeway toward the North Carolina state line on Route 220 each day. With the construction of Alternative B, the forecasted volume using the southbound roadway in 2040 would be less than 4,000 (VDOT, 2020a).

Alternative B, as well as segments of existing roadways (e.g., Soapstone Road) that are included in the interchange or adjacent work, would be built to the latest VDOT design standards. This would reduce both the overall lane miles of substandard elements as well as the volume of drivers traversing roadway segments that are non-conforming.

Other Considerations
The total estimated cost of Alternative B is $745,840,000; more detail is provided in **Section 2.6.** Several elements are unique to the Alternative B alignment and deserve further consideration. In accordance with VDOT standards, Alternative B would cross over the Norfolk Southern railroad with a minimum clearance of 23 feet between the top of the rails and bottom of the roadway structure[26]. Route 220 and the railway follow along a ridge between the Matrimony Creek and

[26] Minimum vertical clearance acceptable for roadway sections crossing the Norfolk Southern Roadway, per VDOT's *Manual of the Structures and Bridge Division*, File No. 06.06-4 (VDOT, 2013).

Marrowbone Creek watersheds in this area. In some areas, the new roadway would be between 40-50 feet above existing ground; for estimating purposes it was assumed that this would be a fill material and not a structure.

Alternative B would intersect two existing utility easements for high tension lines and there is a third easement proposed for a new power line connection to Commonwealth Crossing Business Centre. These unique conditions have been considered in the planning level cost estimate for Alternative B; however, a full understanding of these constraints and cost implications would be developed as part of more detailed design for this alternative.

Table 2-4 summarizes the impacts associated with Alternative B. More detailed environmental information can be found in **Chapter 3: Affected Environment and Environmental Consequences**.

Table 2-4: Impacts Summary – Alternative B

Resource	Impacts
Potential Residential Relocations	26
Potential Commercial Relocations	0
Other Potential Relocations*	5
Streams (Linear Feet)	20,548
Wetlands (Acres)	5.9
Forest (Acres)	261
Historic Sties (Number of Properties)**	5

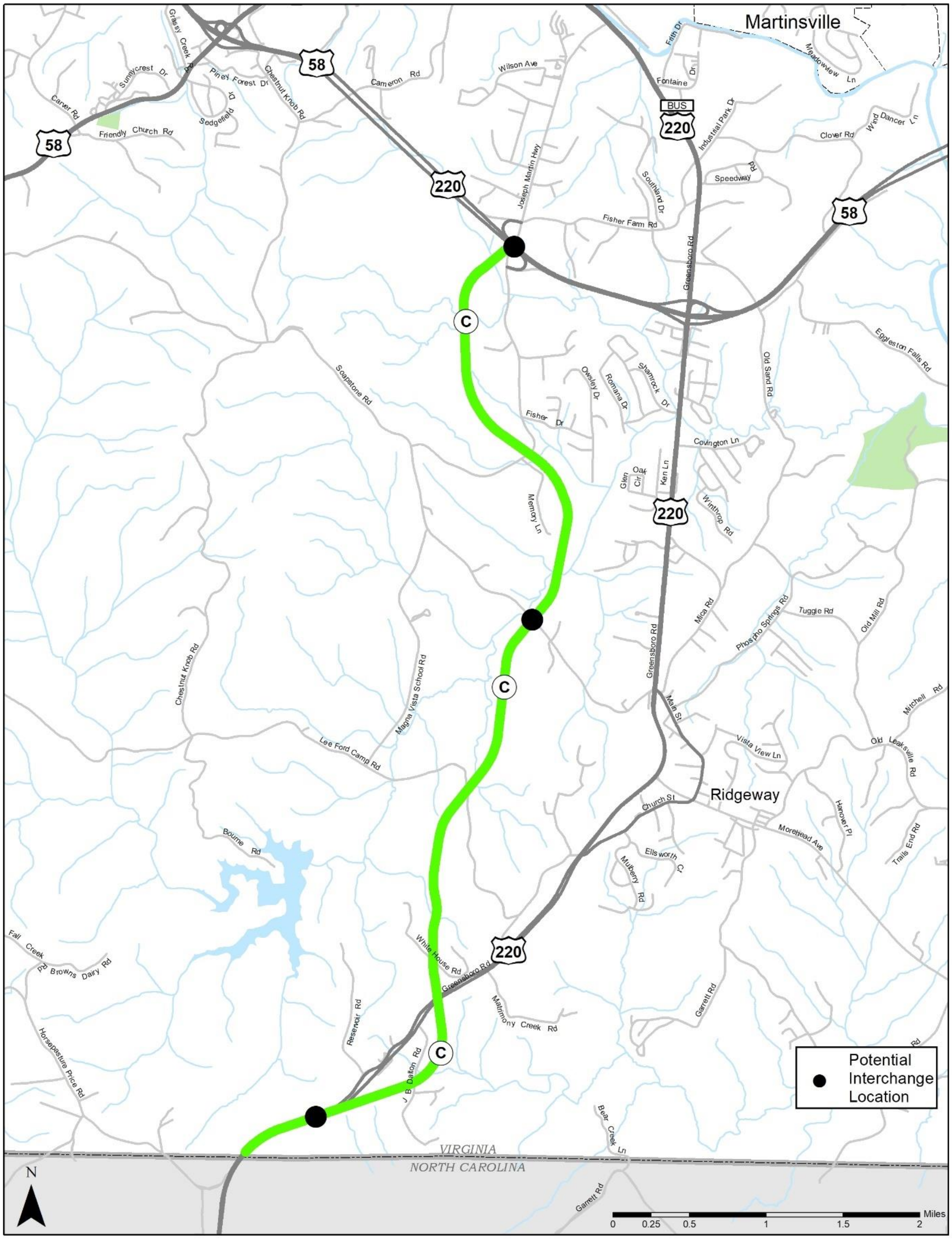
*Includes: Industrial, Institutional, and Cemeteries
**Number of properties on or eligible for listing on the National Register of Historic Places (NRHP)

2.4.3.4 Alternative C (Preferred Alternative)

Alternative C, shown in **Figure 2-10**, would consist of a new roadway alignment that is primarily to the west of existing Route 220. Alternative C was developed as a modification of the initially considered Alignment Option 4C based on agency comments, with the primary changes occurring north of Soapstone Road. Alignment Option 4C originally included an interchange between Joseph Martin Highway and Route 220, however, adequate spacing could not be provided to accommodate all movements. Therefore, the alignment was shifted to tie in at the location of the existing Joseph Martin Highway interchange. Under Alternative C, access would be controlled and provided at two new interchanges and a modified interchange at Route 220/Route 58 and Joseph Martin Highway. For the purposes of the analyses in this Draft EIS it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative C would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad.

Figure 2-10: Alternative C (Preferred Alternative)



The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would continue northward for approximately 1.5 miles, crossing White House Road and a tributary to Marrowbone Creek. The alignment would then shift to the northeast to cross Lee Ford Camp Road. The alternative would then shift northward and continue east of Magna Vista High School and Marrowbone Creek and parallel the Pace Airport to the east. After passing Pace airport, the alignment would shift to the northeast and cross Soapstone Road to the east of Marrowbone Creek. A new interchange with Alternative C would be constructed at Soapstone Road. North of Soapstone Road, the alignment would shift west and cross Joseph Martin Highway. The alignment would continue to the northwest and cross two tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at the existing interchange location with Route 58. This would require modifications to the existing interchange to provide a more direct connection between Route 58 and the new roadway.

Traffic Operations

This alternative would improve traffic flow by providing an efficient north-south connection for regional traffic between the North Carolina state line and Route 58. Route 220 is identified as a CoSS in *VTrans 2040* and is identified as an important freight route to support the region's economy (OIPI, 2015 and WPPDC, 2013). By diverting the regional traffic to an access-controlled facility, while maintaining existing Route 220 as a local business route, Alternative C would reduce travel times for most of the regional traffic while improving access for local traffic that currently uses Route 220. The two new interchanges on the new roadway, in addition to the reconfigured interchange with Joseph Martin Highway and Route 58 would support the mobility of regional traffic into and out of the study area.

The direct access configurations on existing Route 220 would remain the same for most of those living and working along the roadway. The only changes would occur in the southern part of the Route 220 corridor where access control would be implemented as part of the reconstruction of the existing facility. Along this segment, residents along northbound Route 220 would no longer have direct access to the roadway. Access would be provided by a parallel frontage road that connects to the southern interchange. Residents along J.B. Dalton Road south of the new roadway would also access Alternative C from this new frontage road.

Although the access for local residents and businesses along existing Route 220 would remain generally consistent with current configurations, Alternative C would divert 12,800 average annual daily trips of the north-to-south regional through traffic onto the new access-controlled roadway, based on the 2040 forecasts. The regional through trips that would remain on Route 220 are part of the traffic that travels between the southern and eastern limits of the study area, as well as the traffic traveling on Morehead Avenue. As a result, overall delays would be reduced on Route 220. More detailed information on traffic data and analysis is documented in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

Ability of Alternative C to Address the Purpose and Need

Accommodating Regional Traffic

Under the No-Build Alternative, up to 31,900 vehicles are anticipated to travel along Route 220 within the study area in the year 2040. With the construction of Alternative C, the volume is anticipated to decrease to 22,000 vehicles. Under the 2040 forecasted traffic, Alternative C would carry up to 12,800 vehicles (VDOT, 2020a). Existing regional traffic patterns indicate that the majority of travel is to and from the south and west of the study area. Nearly 84 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks that are traveling through the study area, 75 percent continue to the west on Route 58. Of the trucks traveling westbound on Route 58 into the study area, 68 percent continue through without stopping and nearly two-thirds of them travel southbound on Route 220 to North Carolina; therefore, a large portion of these trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative C[27].

Under Alternative C, truck volumes on existing Route 220 would be reduced by approximately 40 percent compared to the 2040 truck volumes under the No-Build Alternative. Compared to 2040 No-Build conditions, simulated average travel times under Alternative C would improve along the existing alignment in both directions, except in the PM peak period during which travel times would remain similar to the No-Build scenario (0.5 percent faster in the southbound direction and 13 percent faster in the southbound direction during the AM peak period). Travel times would be 33 percent faster in the AM peak period and 28 percent faster in the PM peak period along the new alignment between the North Carolina state line and Route 58 compared to predicted travel times along existing Route 220 under the No-Build Alternative, thus improving regional traffic movements. Additional travel time information and operational analyses are included in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

Accommodating Local Traffic
Alternative C would carry up to 12,800 vehicles by 2040, resulting in the removal of 9,900 vehicles from the existing Route 220, a reduction of approximately 31 percent compared to the No-Build Alternative (VDOT 2020a). The lower traffic volumes on existing Route 220 would reduce delays at signalized intersections and would increase the number of gaps available for drivers on side streets to exit onto the roadway facility. The reduced regional traffic on existing Route 220 would potentially result in a decrease in crash rates. Alternative C would result in a minimal reduction in travel time along existing Route 220, when compared to the No-Build Alternative. However, while travel times along existing Route 220 under Alternative C would remain generally consistent compared to No-Build conditions, the change in traffic composition with regional traffic shifting to the new alignment would improve local traffic movements (VDOT 2020a).

As previously mentioned, a large portion of trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative C. According to AASHTO guidelines, "trucks have a greater individual effect on highway traffic operation than do passenger vehicles. The effect on traffic operation of one truck is often equivalent to several passenger cars. The number of equivalent passenger cars equaling the effect of one truck is dependent on the roadway gradient and, for two-lane highways, on the available passing sight distance. Thus, the larger the proportion of trucks in a traffic stream, the greater the equivalent traffic demand and the greater the highway capacity needed" (AASHTO, 2011). Therefore, the reduction of trucks in the traffic system under Alternative C would decrease the potential for severe crashes and increase local connectivity by improving traffic operations on existing Route 220.

[27] Travel patterns and forecasted travel demand have been estimated based on study-specific subarea travel demand model, developed and calibrated consistent with VDOT's *Travel Demand Modeling Policies and Procedures* as well as the methods described in the National Cooperative Highway Research Program's (NCHRP) Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (VDOT, 2014 and TRB, 2014). Detailed discussions of the methods and findings of the travel demand.

Alternative C would result in improvements to overall intersection delay on existing Route 220. As an example, the Soapstone Road/Main Street intersection currently (2018) has an overall delay during the morning peak of 29 seconds and an overall delay of 45 seconds in the afternoon peak hour. In 2040, with Alternative C constructed, the overall forecasted delay reduces to 14 seconds in the morning and reduces to 31 seconds in the afternoon – a reduction of over 50 percent in the morning and 30 percent in the afternoon (VDOT, 2020a). This simulated delay may be further reduced or vary slightly depending on actual travel conditions and driver decisions and behavior.

Addressing Geometric Deficiencies and Inconsistencies
Under Alternative C, the new roadway alignment would be constructed to meet current design standards. The southernmost portion under Alternative C, (approximately 1.7 miles) of existing Route 220 would be reconstructed, which would bring the horizontal and vertical curves up to current design standards in this section and would address the majority of the geometric deficiencies in this segment of existing Route 220. Two instances of substandard stopping sight distance and radii on the southbound approach to the new southern interchange are not addressed with this alternative alignment; however, these could possibly be addressed during detailed design. While allowing these deficiencies to remain is undesirable, a mitigating factor is the reduction in the number of vehicles traveling this segment of the corridor. Currently, approximately 6,000 vehicles travel southbound from Ridgeway toward the North Carolina state line on Route 220 each day. With the construction of Alternative C, the forecasted volume using the southbound roadway in 2040 would be less than 4,000 (VDOT, 2020a).

Alternative C, as well as segments of existing roadways (e.g., Soapstone Road) that are included in the interchange or adjacent work, would be built to the latest VDOT design standards. This would reduce both the overall lane miles of substandard elements as well as the volume of drivers traversing roadway segments that are non-conforming.

Other Considerations
The total estimated cost of Alternative C is $615,910,000; more detail is provided in **Section 2.6**. Several elements are unique to the Alternative C alignment and deserve further consideration. In accordance with VDOT standards, Alternative C would cross over the Norfolk Southern railroad with a minimum clearance of 23 feet between the top of the rails and bottom of the roadway structure[28]. Route 220 and the railway follow along a ridge between the Matrimony Creek and Marrowbone Creek watersheds in this area. In some areas the new roadway would be between 40-50 feet above existing ground; for estimating purposes it was assumed that this would be a fill material and not a structure. Alternative C would intersect two existing utility easements for high tension lines and there is a third easement proposed for a new power line connection to Commonwealth Crossing Business Centre. These unique conditions have been considered in the planning level cost estimate for Alternative C; however, a full understanding of these constraints and cost implications would be developed as part of more detailed design for this alternative.

Table 2-5 summarizes the impacts associated with Alternative C. More detailed environmental information can be found in **Chapter 3: Affected Environment and Environmental Consequences**.

[28] Minimum vertical clearance acceptable for roadway sections crossing the Norfolk Southern Roadway, per VDOT's *Manual of the Structures and Bridge Division*, File No. 06.06-4 (VDOT, 2013).

Table 2-5: Impacts Summary – Alternative C (Preferred Alternative)

Resource	Impacts
Potential Residential Relocations	25
Potential Commercial Relocations	0
Other Potential Relocations*	4
Streams (Linear Feet)	21,882
Wetlands (Acres)	3.7
Forest (Acres)	224
Historic Sties (Number of Properties)**	3

*Includes: Industrial, Institutional, and Cemeteries
**Number of properties on or eligible for listing on the National Register of Historic Places (NRHP)

Identification of Preferred Alternative

Alternative C has been identified as the Preferred Alternative for the Martinsville Southern Connector Study. Alternative C is the Preferred Alternative because it best balances cost and impact while meeting the Purpose and Need.

As part of the identification of the Preferred Alternative, the public was invited to provide review and feedback on the recommendation. Information and details regarding the dates, location, and public feedback provided is included in **Chapter 6.0: Comments and Coordination**. Following VDOT's recommendation of Alternative C as the Preferred Alternative and informed by public comments received as well as input from the Participating Agencies, the USACE and the United States Environmental Protection Agency (EPA) provided their concurrence that Alternative C is the recommended Preferred Alternative on September 4, 2019. As part of the concurrence on the Preferred Alternative, VDOT, FHWA, USACE, and EPA agreed that modifications or shifts in the Preferred Alternative may be evaluated in the Final EIS to minimize impacts to private properties, natural resources, or to further refine preliminary cost estimates. These refinements would be incorporated into the Final EIS and Joint Permit Application (JPA) that will be used to facilitate Federal permits being issued in conjunction with an anticipated Record of Decision (ROD) to meet the specific timelines and milestones outlined in the One Federal Decision (OFD) process[29].

Based on agency concurrence and public input on the Preferred Alternative, the CTB approved the location of Alternative C during its meeting in January 2020. The CTB resolution is included in **Appendix C** of this document.

2.4.4 Alternatives Not Retained

Alternatives D and E were eliminated from further consideration and detailed evaluation based on context and intensity[30] of the anticipated property impacts.

As the alternative development process outlined in **Section 2-1** progressed, and through agency coordination (see **Chapter 6: Comments and Coordination**) efforts; FHWA, VDOT and the Concurring agencies concurred in March 2019 to carry forward a range of alternatives, including Alternatives D and E, for evaluation. However, as part of this concurrence, VDOT informed the agencies that there were concerns with the potential number of private property impacts that could

[29] The Martinsville Southern Connector Study is following the OFD process, subsequent to receiving OFD designation by FHWA. OFD requires that major infrastructure projects have a single permitting timetable for synchronized environmental reviews and authorizations: www.permits.performance.gov/permitting-projects/us-route-58220-bypass-north-carolina-state-line-limited-access-study.

[30] Context refers to significance of an impact by geography (national, regional, or local) – where the impact occurs. Intensity refers to the severity of the impact, in whatever context(s) it occurs. See 40 CFR § 1508.27.

occur under Alternatives D and E and the concurrence included stipulations regarding the potential elimination of Alternatives carried forward based on preliminary right of way information [see Appendix A of the ***Alternatives Analysis Technical Report*** (VDOT, 2020b)]. As each alternative in the study is assumed to be a controlled access facility, frontage roads would need to be constructed along Route 220 under either of these alternatives to maintain access to private properties along the corridor. The addition of frontage roads to reconstructing Route 220 as an access-controlled facility would require a considerable amount of additional right of way as discussed in **Section 2.4.1**. The minimum right of way width required for a new locations alternative without frontage roads is 168 feet, whereas Alternative D and E would require a minimum right of way width of 275 feet along the entire corridor.

VDOT noted that once preliminary right of way impacts were understood, a recommendation would be brought to the agencies as to if these alternatives should be considered feasible and be evaluated as a potential preferred alternative. This approach was documented in the concurrence on the range of alternatives following the March 2019 agency coordination meeting [see **Chapter 6: Comments and Coordination** and ***Appendix D*** *of the* ***Alternatives Analysis Technical Report*** (VDOT, 2020b)].

During the next several agency meetings, the agencies continued to discuss these alternatives and, during the June 2019 agency coordination meeting, VDOT reported that additional analysis indicated both alternatives would require large numbers of residential and commercial relocations (see **Table 2-6 thru 2-9**). Alternative D would require 84 relocations and Alternative E would require 130 relocations. Based on the limited number of suitable and comparable properties available in the area, it would be logistically infeasible to implement either of these two Build Alternatives. Therefore, considering the context and severity of these anticipated impacts, FHWA and VDOT determined that Alternatives D and E would not be retained in this Draft EIS for detailed evaluation. Following the June 2019 agency meeting, the Concurring Agencies did not object to this determination. These alternatives and a summary of the rationale for eliminating them are discussed in further detail below.

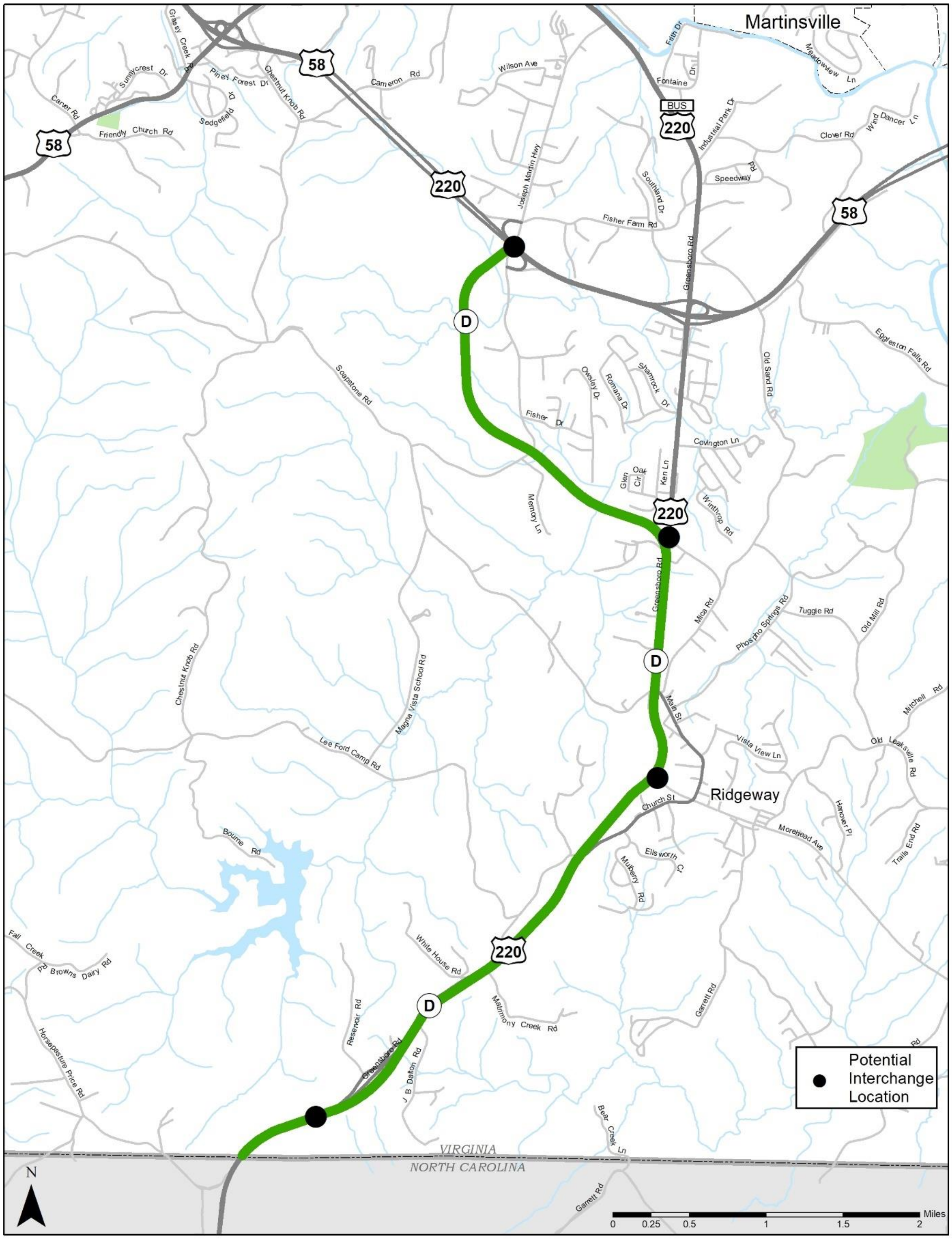
2.4.4.1 Alternative D

Alternative D, shown in **Figure 2-11**, would consist of reconstructing existing Route 220 as an access-controlled roadway for approximately 5.6 miles from the North Carolina state line where it would then divert to the west on a new access-controlled roadway just north of Water Plant Road. Under Alternative D, access would be controlled and provided at three new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. South of Water Plant Road, access to the new roadway would be made via frontage roads and new interchanges near Reservoir Road and at Morehead Avenue. A new structure providing access to Route 220 would be located at Lee Ford Camp Road/Church Street. At Water Plant Road an interchange is suggested where the new roadway branches from Route 220 to provide direct access between the new roadway and Route 220 to the north. From this interchange, the new alignment travels northwest, crossing Marrowbone Creek and then parallels a tributary of Marrowbone Creek to beyond Joseph Martin Highway. The alignment then shifts northward and follows the same alignment as Alternatives B and C just north of the Radial warehouse site to the tie-in location with Route 58. Modifications to the interchange at Route 58 and Joseph Martin Highway would be required with this alternative. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Traffic Operations

This alternative would improve traffic flow by providing an efficient north-south connection for regional traffic to travel between the North Carolina state line and Route 58. Route 220 is identified as a CoSS in *VTrans 2040* and is identified as an important freight route to support the region's economy (OIPI, 2015 and WPPDC, 2013).

Figure 2-11: Alternative D



By diverting the regional traffic to a access-controlled facility while maintaining existing Route 220 as a local business route, Alternative D would reduce travel times for most of the regional traffic while improving access for local traffic that currently uses Route 220. The three new interchanges and the modified interchange at Route 58 and the Joseph Martin Highway would support the mobility of the regional traffic into and out of the study area. The direct access configurations on existing Route 220 from the North Carolina state line to Ridgeway would be shifted to frontage roads. Access to and from the following local roads would be provided via the new interchange at Reservoir Road: Reservoir Road, White House Road, J.B. Dalton Road, Matrimony Creek Road, and Route 220 south of Lee Ford Camp Road and Main Street. Access between Lee Ford Camp Road and Route 220 would be made by crossing under the Alternative D roadway, following Main Street into Ridgeway, and then using Morehead Avenue to reach the new interchange at Morehead Avenue and Alternative D. Access to Route 220 from Ridgeway and points east would use the new interchange at Morehead Avenue. Access from Soapstone Road, as well as properties on Andra Drive, Parker Compton Place, Water Plant Road, and the southbound side of Route 220 would occur via an extension of Soapstone Road that parallels on the east side of Alternative D to a new interchange north of Water Plant Road. Soapstone Road would continue northward to Route 220. All access from Mica Road and intersections to the north would remain as they exist today. The reconfigured northern interchange is anticipated to improve access to and from Martinsville by providing a direct connection from Alternative D to Joseph Martin Highway to the north.

Although the access for local residents and businesses along existing Route 220 from the North Carolina state line to Ridgeway would be shifted to frontage roads, Alternative D would divert 12,800 average annual daily trips of the north-to-south regional vehicle trips onto the new access-controlled roadway, based on the 2040 forecasts. The regional through trips that would remain on Route 220 are part of the traffic that travels between the southern and eastern limits of the study area, as well as the traffic traveling on Route 87. As a result, overall delays would be reduced on Route 220. More detailed information on traffic data and analysis is documented in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a). The reconfigured northern interchange is anticipated to improve access to and from Martinsville by providing a direct connection from Alternative D to Joseph Martin Highway to the north.

Ability of Alternative D to Address the Purpose and Need

Accommodating Regional Traffic

Under the No-Build Alternative up to 31,900 vehicles were anticipated to travel along Route 220 within the study area in the year 2040. With the construction of Alternative D, the volume is anticipated to decrease to 20,500 vehicles. Under the 2040 No-Build forecasted traffic, Alternative D would carry up to 12,800 vehicles (VDOT, 2020a). Existing regional traffic patterns indicate that the majority of travel is to and from the south and west of the study area. Nearly 84 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks that are traveling through the study area, 75 percent continue to the west on Route 58.

Of the trucks traveling westbound on Route 58 into the study area, 68 percent continue through it without stopping, and nearly two-thirds of them travel southbound on Route 220 to North Carolina, therefore, a large portion of these trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative D[31].

This new northern interchange with Route 58 would be approximately 1.4 miles to the west of the Route 220 interchange at Route 58. As a result, the regional traffic traveling to or from the east on Route 58 may be more likely to use Route 220 instead of the new roadway; however, this volume would be much less than the volume that enters or leaves the study area to the west – most of the traffic travels between the southern and western limits of the study area.

In 2018, only four percent of the commercial vehicles crossing into the study area from North Carolina traveled east on Route 58, compared to 62 percent traveling to the west. Only eight percent of the westbound commercial vehicles entering the study area at Route 58 turned southward toward North Carolina, while 42 percent of the commercial vehicles from the west turned to the south. The dominant movement is between the south and west. The fastest path between Morehead Avenue or Route 58 and the North Carolina state line would be to use Route 220; however, as a result of the 12,800 vehicles diverting to the new roadway, the anticipated volumes on Route 220 north of Ridgeway C would be decreased such that travel times in the corridor would be improved when compared to the No-Build condition.

Under Alternative D, truck volumes on existing Route 220 would be reduced by approximately 38 percent compared to the 2040 truck volumes under the No-Build Alternative. Compared to 2040 No-Build conditions, simulated average travel times under Alternative D would improve along the existing alignment in both directions (23 percent and 26 percent faster in the AM and PM peak period, respectively). Travel times would be seven percent faster in the AM peak period and nine percent faster in the PM peak period along the new alignment between the North Carolina state line and Route 58 compared to predicted travel times along existing Route 220 under the No-Build Alternative, thus improving regional traffic movements. Additional travel time information and operational analyses are included in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

Accommodating Local Traffic

Alternative D would carry up to 12,800 vehicles by 2040, resulting in the removal of 11,400 vehicles from Route 220, a reduction of approximately 35 percent compared to the No-Build Alternative (VDOT 2020a). The lower traffic volumes on existing Route 220 would reduce delays at the signalized and unsignalized intersections and would increase the number of gaps available for drivers on side streets to exit onto the roadway facility. The reduced regional traffic on the existing Route 220 would potentially result in a decrease in crash rates. Alternative D would result in a minimal reduction in travel time along existing Route 220, when compared to the No-Build Alternative. However, while travel times along existing Route 220 under Alternative D would remain generally consistent compared to No-Build conditions, the change in traffic composition

---

[31] Travel patterns and forecasted travel demand have been estimated based on study-specific subarea travel demand model, developed and calibrated consistent with VDOT's *Travel Demand Modeling Policies and Procedures* as well as the methods described in the NCHRP Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (VDOT, 2014 and TRB, 2014). Detailed discussions of the methods and findings of the travel demand modeling conducted for this study can be found in the Traffic and Transportation Technical Report (VDOT, 2019a). Final design-level traffic engineering and analysis would be conducted as part of advanced engineering and design on any improvements that advance from this study.

with regional traffic shifting to the new alignment would improve local traffic movements (VDOT 2020a).

As previously mentioned, a large portion of trucks would be expected to diverge from existing Route 220 and onto the new alignment of Alternative D. According to AASHTO guidelines, "trucks have a greater individual effect on highway traffic operation than do passenger vehicles. The effect on traffic operation of one truck is often equivalent to several passenger cars. The number of equivalent passenger cars equaling the effect of one truck is dependent on the roadway gradient and, for two-lane highways, on the available passing sight distance. Thus, the larger the proportion of trucks in a traffic stream, the greater the equivalent traffic demand and the greater the highway capacity needed" (AASHTO, 2011). Therefore, the reduction of trucks in the traffic stream under Alternative D would decrease the potential for more severe crashes and increase local connectivity by improving traffic operations on existing Route 220.

Alternative D would result in improvements to overall intersection delay on existing Route 220. As an example, the intersection of Route 220 and the off-ramp from eastbound Route 58 currently has an overall delay during the morning peak of 45 seconds and an overall delay of 177 seconds in the afternoon peak hour. In 2040, with Alternative D constructed, the overall delay would be reduced to 12 seconds in the morning and reduced to 15 seconds in the afternoon – a reduction of over 70 percent in the morning and 92 percent in the afternoon (VDOT, 2020a). This simulated delay may be further reduced or vary slightly depending on actual travel conditions and driver decisions and behavior.

Addressing Geometric Deficiencies and Inconsistencies
Under Alternative D, the new roadway alignment would be constructed to meet current design standards. The southernmost portion under Alternative D (approximately 5.6 miles) of existing Route 220 would be reconstructed, which would correct all 14 of the identified geometric deficiencies. Alternative D, as well as segments of existing roadways (e.g., Soapstone Road) that were included in the interchange or adjacent work would be built to the latest VDOT design standards. This would bring the horizontal and vertical curves up to current design standards in this section, which would address the geometric deficiencies identified in this segment of existing Route 220.

Other Considerations
The total estimated cost of Alternative D is $793,546,000. Several elements are unique to the Alternative D alignment and deserve further consideration. As noted in **Section 2.5**, Alternative D would have a considerable number of residential and business relocations. At the May 2019 agency meeting, VDOT presented estimated relocations for all the alternatives retained for evaluation. **Table 2-6** illustrates the potential relocations for Alternative D as presented during the monthly agency meeting. In reviewing the numbers, VDOT explained that these numbers were derived by counting the properties within the LOD and noting the property type indicated in the Henry County tax records. No investigations were completed to determine if a residential unit was inhabited by more than one family or if a commercial property housed more than one business. The numbers also only assume relocations per the methodologies agreed upon for the study (See **Chapter 3: Affected Environment and Environmental Consequences** for additional information). Therefore, these numbers were considered to be a lower range of what may have actually been impacted as additional relocations may have been necessary if Alternative D advanced to more detailed design. While Alternative D satisfies the study's Purpose and Need elements, the magnitude of property impacts associated with this alternative would be greater than many of the other alternatives.

Table 2-6: Property Relocations – Alternative D

	Residential	Commercial	Industrial	Institutional	Cemetery	Total
Number of Impacted Properties	56	21	4	1	2	84

Preliminary cost estimates have been completed for all alternatives retained for evaluation, including Alternative D. While these estimates are considered preliminary, they offer some distinct breakdowns in cost, as discussed in **Section 2-6**. Alternative D would be less costly for grading and drainage than other alternatives, as it would be on an existing roadway prism; however, Alternative D would have measurably higher costs associated with right of way. Additionally, the number of residential and commercial relocations required and the limited number of suitable and comparable properties available rendered Alternative D logistically infeasible. The level of displacements and/or relocations to residential and commercial properties would only further challenge the economic tax base of Henry County, already impacted by the downsize within the textile and furniture sectors[32]. Additional information regarding the socioeconomic history of the study area can be found in **Section 3.2** and **Section 3.13**.

In addition to the higher cost associated with Alternative D, there would also be immeasurable logistical challenges related to implementing this alternative compared to Alternatives A, B, or C. **Table 2-7** lists the number of residential properties on the market in different geographic ranges. As illustrated in this table, there are not enough properties within the Drewry Mason Elementary School zone or Ridgeway to implement Alternative D. While the numbers exist (as of June 2, 2019) within the Martinsville area to support the relocations assumed under this alternative, it may not be realistic to assume that all the relocated households could accept moving away from their school or other community facilities, as the anticipated relocations would exceed the number of available residential properties within the study area (near Drewry Mason Elementary or Ridgeway). In addition, the available properties may not be functionally equivalent to the residences that would be impacted.

Table 2-7: Available Residential Properties – Alternative D

	Residential Relocations	Near Drewry Mason Elementary	Near Ridgeway	In Martinsville
Number of Properties	56	18	27	184

Source: Remax.com (June 2, 2019. Note: These searches may result in overlapping results. It should not be assumed that there are 229 unique properties available in the region).

Alternative D would also cross over an existing utility easement for high tension lines, and there is a second easement proposed for a new power line connection to Commonwealth Crossing Business Centre. VDOT evaluated opportunities to optimize Alternative D and reduce impacts by realigning the portion of Alternative D on new alignment, shifting the alignment to new location further south and modifying the interchange configuration with Joseph Martin Highway. However, the impacts were still considered too great for VDOT to recommend that the alternative be considered further or carried through for detailed study. Therefore, considering the context and

[32] According to local area unemployment statistical data obtained from the Bureau of Labor Statistics, the unemployment rate in Henry County has remained consistently higher than that of Virginia and the U.S. Between 2008 and 2018, the average unemployment rate in Henry County was 8.7 percent, whereas the statewide average was 6.0 and the nationwide average was 6.9 (BLS, 2019).

severity of these anticipated costs and logistical challenges of these property impacts, VDOT determined that Alternative D would not be feasible and recommended that it be eliminated from further consideration. There were no objections to this recommendation from the agencies involved in the study and, as a result, Alternative D was eliminated from further consideration following the June 2019 agency coordination meeting.

2.4.4.2 Alternative E

Alternative E, shown in **Figure 2-12**, would consist of fully reconstructing existing Route 220 as an access-controlled roadway between the North Carolina state line and Route 58, removing all direct connections of existing driveways and side streets to Route 220.

Under Alternative E, access would be controlled and provided only at interchanges at various locations in the corridor. Existing residential and commercial driveways would be directed to frontage roads that parallel the roadway, ultimately connecting to Route 220 at interchanges. New interchanges to provide frontage road access to Route 220 are located at Reservoir Road and at Morehead Avenue. Structures over or under the new Route 220 roadway are included at Lee Ford Camp Road/Church Street and Soapstone Road/Main Street to provide east-west connectivity. The Route 220 interchange at Route 58 would be modified to provide direct access between the new roadway, Route 58, and Business Route 220 to the north.

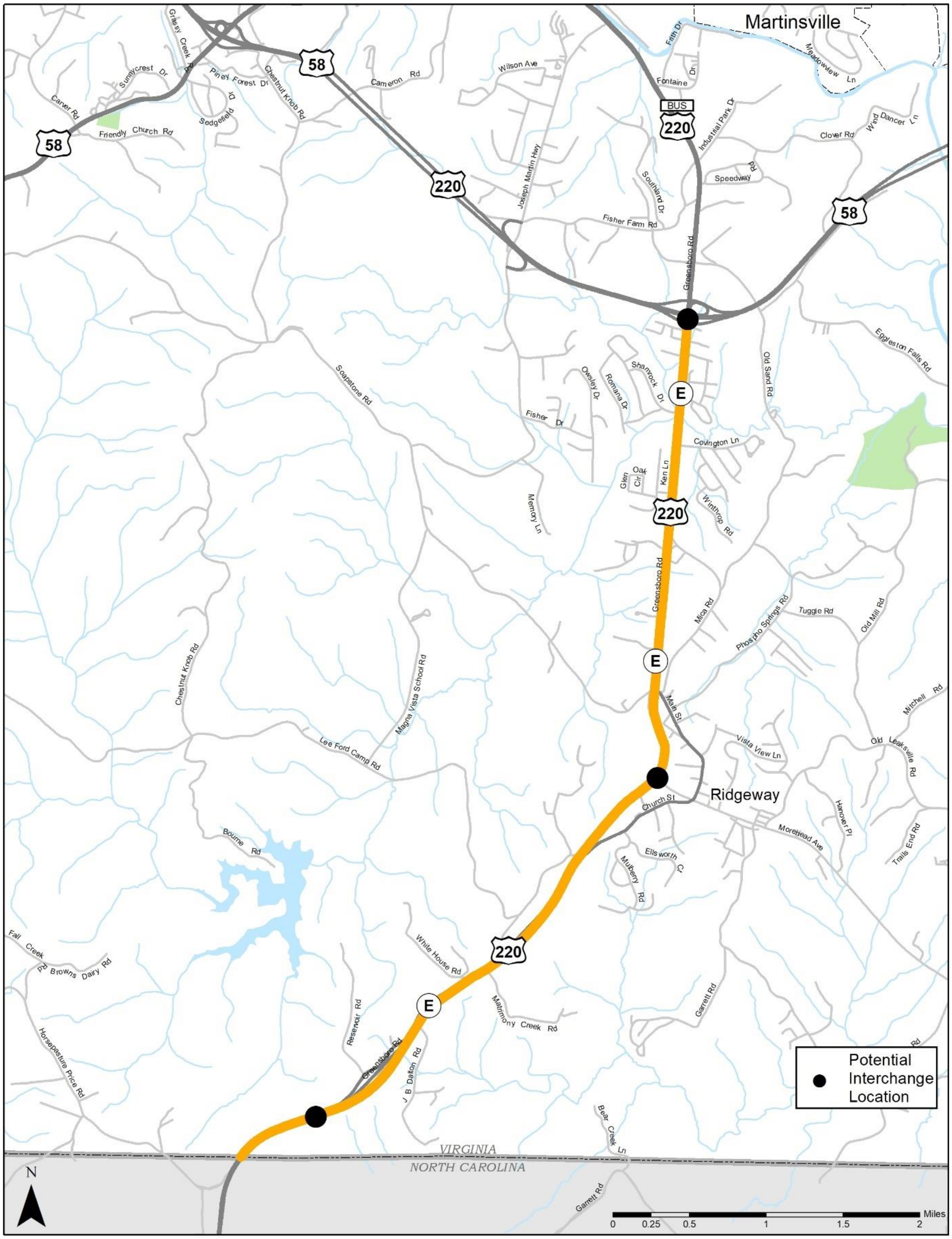
Traffic Operations

Alternative E would improve traffic flow by providing an efficient north-south connection for regional traffic to travel between the North Carolina state line and Route 58. Route 220 is identified as a CoSS in *VTrans 2040* and is identified as an important freight route to support the region's economy (OIPI, 2015 and WPPDC, 2013). Alternative E would include the full reconstruction of Route 220 to an access-controlled facility and include two new interchanges, an extensive network of frontage roads to provide local access and connections to interchanges, and modification of an interchange at Route 220/Route 58. Alternative E would provide an access-controlled facility for all the potential regional traffic within the study area and minimize the north-south travel time of through traffic; however, there are considerable impacts to local access and mobility. East-west connectivity within the study area is made primarily by grade separations at Lee Ford Camp Road/Church Street and at Soapstone Road/Main Street over Route 220.

All direct access to Route 220 would be shifted to frontage roads. Access to Reservoir Road, White House Road, J.B. Dalton Road, Matrimony Creek Road, and Route 220 south of Lee Ford Camp Road and Main Street would occur via frontage roads to the new interchange at Reservoir Road. Access from Lee Ford Camp Road to Route 220 would occur via crossing under the new roadway, following Main Street into Ridgeway, and then using Morehead Avenue west to a new interchange at Morehead Avenue/Route 220. Drivers accessing the roadway from Ridgeway and points east would also use this new interchange at Morehead Avenue/Route 220.

Access from side streets or driveways adjacent to Route 220 in north of Ridgeway would be provided by frontage roads that parallel the reconstructed Route 220. Access from Kilarney Court, Villa Road, Shamrock Drive, Covington Lane, Marrowbone Circle, Steve Drive, Water Plant Road, Mica Road, Parker Compton Place, Andra Drive, Soapstone Road, or Main Street would be made by travelling south along the frontage roads, following Main Street into Ridgeway, and accessing the new interchange at Morehead Avenue/Route 220.

Figure 2-12: Alternative E



Ability of Alternative E to Address the Purpose and Need

Accommodating Regional Traffic

Under the No-Build Alternative up to 31,900 vehicles were anticipated to travel along Route 220 within the study area in the year 2040. With the construction of Alternative E, the volume is anticipated to decrease to 20,400 vehicles (VDOT, 2020a). This reduction appears to have been a result of the direct local roadway connections to Route 220 being cut off; it would be more convenient for local users to use the adjacent local roadway network to move about the study area instead of using Route 220. Regional traffic traveling to and from the south at the North Carolina state line on Route 220, as well as the regional traffic that uses Morehead Avenue to travel to and from the southeast and the manufacturing center of Eden, North Carolina would use Alternative E. Existing regional traffic patterns indicate that the majority of travel is to and from the south and west of the study area. Nearly 84 percent of the trucks entering Route 220 from North Carolina travel through the study area without stopping (VDOT, 2020a). Of these trucks that are traveling through the study area, 75 percent continue to the west on Route 58. Of the trucks traveling westbound on Route 58 into the study area, 68 percent continue through without stopping, and nearly two-thirds of them travel southbound on Route 220 to North Carolina, therefore, a large portion of these trucks would be expected to utilize the reconstructed Route 220 under Alternative E[33].

Compared to 2040 No-Build conditions, simulated average travel times under Alternative E would mostly increase along the Route 220 corridor in both directions (15 percent and 254 percent slower in the AM and PM peak period, respectively). Additional travel time information and operational analyses are included in the ***Traffic and Transportation Technical Report*** (VDOT, 2020a).

Accommodating Local Traffic

Shifting the regional traffic to a new access-controlled roadway greatly reduced the likelihood of severe crashes at side streets, however the added time and cost for local roadway users to access businesses, cross Route 220 from east to west, and the need to drive out of their way to reach an interchange ramp were negative effects of Alternative E.

Overall intersection delays would be reduced considerably, as the local traffic that would be waiting for gaps in the traffic along Route 220 would be diverted to frontage roads and intersections at interchanges. As an example, in the No-Build condition the intersection delay at the Drewry Mason Elementary School exit at Route 220 in the afternoon was over 300 seconds. With the frontage roads filtering traffic to Main Street, the intersection delay at the new Main Street intersection with the frontage road would be only 82 seconds. While delays would typically be reduced, local traffic would have to travel farther and longer to reach destinations.

Alternative E would change local traffic patterns and restrict east-west connectivity. As an example, access to northbound Route 220 from Covington Lane north of Ridgeway is made in

---

[33] Travel patterns and forecasted travel demand have been estimated based on study-specific subarea travel demand model, developed and calibrated consistent with VDOT's *Travel Demand Modeling Policies and Procedures* as well as the methods described in the NCHRP Report 765: *Analytical Travel Forecasting Approaches for Project-Level Planning and Design* (VDOT, 2014 and TRB, 2014). Detailed discussions of the methods and findings of the travel demand modeling conducted for this study can be found in the Traffic and Transportation Technical Report (VDOT, 2019a). Final design-level traffic engineering and analysis would be conducted as part of advanced engineering and design on any improvements that advance from this study.

the existing condition by simply making a right turn. To travel southbound, drivers would wait for a gap in traffic, proceed to the median crossover, and then make a left turn once the roadway is clear. Alternative E would require all drivers wishing to access Route 220 to turn left from Covington Lane, travel south on a new frontage road, south on Mica Road and Main Street into Ridgeway, and then onto Morehead Avenue to the new interchange. This would add three miles to each trip, one way. Residents and business owners along the many other side streets with direct access to Route 220 within the study area would have similar experiences albeit with varying travel times and distances to interchanges. Businesses that are reliant on drive-by visibility such as restaurants and automotive uses would still have visibility to the access-controlled roadway; however direct access would be eliminated. While this alternative would have considerable safety benefits for those who live and work in the study area, it would require additional time and fuel to reach most destinations both within and beyond the study area.

Addressing Geometric Deficiencies and Inconsistencies
Under Alternative E, the new roadway alignment would be constructed to meet current design standards. The entire length of Route 220 was assumed to be reconstructed with Alternative E, which would directly remove all 14 of the southbound geometric deficiencies, as well as remove all the substandard turn lanes and roadside shoulders along Route 220. Alternative E, as well as segments of existing roadways (e.g., Soapstone Road) that would be included in the interchange or adjacent work, would be built to the latest VDOT design standards. Overall, this would reduce both the overall lane miles of substandard elements as well as the volume of drivers traversing roadway segments that are non-conforming.

Other Considerations
Given the scope of the geometric deficiencies present in the southern section of the Route 220 corridor within the study area, coupled with the rolling topography in the region as noted in **Section 2.1**, an option to simply improve the existing roadway was not appropriate, and a full reconstruction was assumed to develop the worst-case scenario for the impacts associated with Alternative E. Alternative E would address regional traffic needs by eliminating the numerous driveways and local access points that interfered with through traffic, providing an access-controlled facility between the North Carolina state line and Route 58. Access to the new roadway would be limited to three interchanges with sufficient acceleration and deceleration lanes to decrease delays and travel times for freight carriers and those traveling through the study area on Route 220 and Route 58.

The total estimated cost of Alternative E is $718,823,000. Several elements are unique to the Alternative E alignment and deserve further consideration. As noted in **Section 2.5**, Alternative E would have a considerable number of residential and business relocations, primarily due to the need to build two new interchanges and reconfigure the existing interchange at Route 58. The interchange at Morehead Avenue could be built with minimal impacts to resources, however the modified interchange at Route 58 and the new interchange at Reservoir Road would impact well-established communities. The need to provide over 10 miles of frontage roads also contributed additional cost and impacts.

At the May 2019 agency meeting, VDOT presented estimated relocations for all the alternatives retained for evaluation. **Table 2-8** illustrates the potential relocations for Alternative E as presented during the monthly agency meeting. In reviewing the numbers, VDOT explained that these numbers were derived by counting the properties within the LOD and noting the property type indicated in the Henry County tax records. No investigations were completed to determine if a residential unit was inhabited by more than one family or if a commercial property housed more than one business. The numbers also only assume relocations per the methodologies agreed upon for the study (see **Chapter 3: Affected Environment and Environmental Consequences** for additional information). Therefore, these numbers were considered to be a lower range of what may have actually been impacted as additional relocations may have been necessary if Alternative E advanced to more detailed design. While Alternative E satisfies the study's Purpose and Need elements, the magnitude of relocations associated with this alternative would be greater than many of the other alternatives.

Table 2-8: Potential Relocations – Alternative E

	Residential	Commercial	Industrial	Institutional	Cemetery	Total
Number of Impacted Properties	97	27	1	3	2	130

Preliminary cost estimates have been completed for all alternatives retained for evaluation, including Alternative E. While these estimates are considered preliminary, they offer some distinct breakdowns in cost, as discussed in **Section 2.6**. Alternative E would be less costly for grading and drainage than other Build Alternatives, as it would be on an existing roadway prism; however, Alternative E would have measurably higher costs associated with right of way. Additionally, the number of residential and commercial relocations required and the limited number of suitable and comparable properties available rendered Alternative E logistically infeasible. As noted earlier, the level of displacements and/or relocations to residential and commercial properties would only further challenge the economic tax base of Henry County, already impacted by the downsize within the textile and furniture sectors[34]. Additional information regarding the socioeconomic history of the study area can be found in **Section 3.2** and **Section 3.13**.

In addition to the higher cost associated with Alternative E, there would also be immeasurable logistical challenges related to implementing this alternative compared to Alternatives A, B, or C. **Table 2-9** lists the number of residential properties on the market in different geographic ranges. As illustrated in this table, there are not enough properties within the Drewry Mason Elementary School zone or Ridgeway to implement Alternative E. While the numbers exist (as of June 2, 2019) within the Martinsville area to support the relocations assumed under this alternative, it may not be realistic to assume that all the relocated households could accept moving away from their school or other community facilities, as the anticipated relocations would exceed the number of available residential properties within the study area (near Drewry Mason Elementary or Ridgeway). In addition, the available properties may not be functionally equivalent to the residences that would be impacted.

Table 2-9: Available Residential Properties – Alternative E

	Residential Relocations	Near Drewry Mason Elementary	Near Ridgeway	In Martinsville
Number of Properties	97	18	27	184

Source: Remax.com (June 2, 2019. Note: These searches may result in overlapping results. It should not be assumed that there are 229 unique properties available in the region.

[34] According to local area unemployment statistical data obtained from the Bureau of Labor Statistics, the unemployment rate in Henry County has remained consistently higher than that of Virginia and the U.S. Between 2008 and 2018, the average unemployment rate in Henry County was 8.7 percent, whereas the statewide average was 6.0 and the nationwide average was 6.9 (BLS, 2019).

As the project proponent, VDOT has a desire to implement an alternative that meets the Purpose and Need for the study, while balancing cost and impact. Though there is not a threshold for the number of impacts that are acceptable for a given project, the sheer number, associated costs, and logistical challenges of Alternative E does not reflect such a balance. Therefore, considering the context and severity of the costs and logistical challenges of these property impacts, VDOT determined that Alternative E would not be feasible and recommended that it be eliminated from further consideration. There were no objections to this recommendation from the agencies involved in the study and, as a result, Alternative E was eliminated from further consideration following the June 2019 agency coordination meeting.

2.4.4.3 Access Management Options and Arterial Preservation

Following the identification and recommendation of Alternative C as the Preferred Alternative, VDOT and FHWA initiated a public comment period between July and August 2019 to solicit input on the Preferred Alternative (Alternative C). Accompanying the comment period, a Public Hearing was also conducted on August 15, 2019 to present the Preferred Alternative and provide an opportunity for public input. Comments submitted to VDOT suggested that this Draft EIS include additional considerations of potential upgrades to the existing Route 220 corridor. The following suggested improvements can collectively be categorized as access management options:

- Free flow option that replaces the three existing signalized intersections on existing Route 220 through the study area (south of the interchange with Route 58) with interchanges, converts the remaining intersections with cross-street movements to restricted cross-street u-turn (RCUT) configurations, and remedies geometric deficiencies;
- Partial control of access, in which certain segments of Route 220 are converted to full access control through the extension and/or connection of local roads to reduce or consolidate access demands on the highway, and remaining segments are upgraded with intersection improvements and correction of geometric deficiencies; and
- Advanced intersection design, focused on the replacement of existing signalized intersections with innovative solutions to improve traffic flow, such as roundabouts or continuous flow intersections.

Public comments received during the July and August 2019 comment period suggested consideration of the above listed improvements or other similar techniques typically evaluated as part of VDOT's Arterial Preservation Program (APP). The APP encourages innovative strategies to implement safety and capacity improvements on arterial highways throughout the Commonwealth of Virginia. While APP implementation strategies may offer localized benefits to preserve the existing conditions of the Route 220 corridor, they are typically considered near-term operational improvements and would likely focus primarily on signal timing improvements within the study area. As previously mentioned, there are a total of five signalized intersections along existing Route 220 in the study area, with an additional 18 unsignalized median crossovers and over 100 residential and commercial driveways with direct access to the roadway.

Similar to Alignment Option 2 (TSM and TDM) described in **Section 2.2.1** and Alternative E (full reconstruction and upgrade of Route 220) discussed in **Section 2.5.2**, these localized improvement options would not address the Purpose and Need for the study. Similar to Alignment Option 2 (TSM and TDM) described in **Section 2.2.1** and Alternative E (full reconstruction and upgrade of Route 220) discussed in **Section 2.5.2**, these localized improvement options would not address the Purpose and Need for the study. These options and this study have differing goals; however, these localized improvements would not be precluded from future implementation outside the scope of this study.

While the Martinsville Southern Connector Study's goals differ then the APP's, VDOT remains committed to preserving the functionality and service of arterial roadways statewide, including

U.S. Route 220. Presently, VDOT has developed a list of focused improvements for 60 miles of Route 220 from the North Carolina line to Route 419 in Roanoke. While these improvements would ensure the safety and preserve the capacity of the arterial highway network, they would not fully address the Purpose and Need for the Martinsville Southern Connector Study. Therefore, they are considered separately as part of the Route 220 Preservation and Improvement Plan. Additional discussion of the considerations regarding these suggested transportation improvements is included in the subsections that follow.

Accommodating Regional Traffic

Innovative intersections at particular locations along the corridor may improve mobility and provide some measure of improved regional traffic traveling through the study area; however, in the absence of access control, the regional traffic would still be subject to conflict points associated with the five signalized intersections (where signal timing improvements could be made as part of the APP), 18 unsignalized median crossovers and over 100 residential and commercial driveways located along existing Route 220 in the study area. Access control measures along existing Route 220 would likely improve travel times for freight carriers and those traveling through the study area on Route 220 and Route 58.

Accommodating Local Traffic

Considering the number of access points and signalized and unsignalized intersections along Route 220 in the study area, implementation of any free flow improvements or partial access control to accommodate regional traffic would offer minimal benefits to local traffic that currently uses Route 220 for access to residences and businesses as well as trips to Drewry Mason Elementary School. Innovative intersections and modifications to the corridor that may help to preserve the arterial through movements of regional traffic would likely have some negative impact on local traffic by eliminating existing access on Route 220.

Connecting or extending existing local roads to reduce or consolidate access demands on existing Route 220 may improve delays at existing intersections and median crossovers; however, these improvements would add additional travel time and distance for local traffic to reach destinations, which would not address this element of need. Furthermore, implementation of innovative intersections at particular locations along the corridor may result in right of way impacts to the multiple residential and commercial properties that currently have access or property frontage along existing Route 220.

Addressing Geometric Deficiencies and Inconsistencies

Access improvements that modify intersections and traffic signals, reduce conflict points, increase sight distance, consolidate access points, or upgrade shoulders would not address geometric deficiencies and inconsistencies, as the scope of work of these minor improvements would not correct the substandard sharp curves and abrupt changes in grade that exist along Route 220. In order to address the inadequate stopping sight distances associated with the sub-standard horizontal and vertical curves along existing Route 220 in Segment A, substantial cuts or fills and associated construction costs would be required. Consolidating access points or introducing innovative intersection design to accommodate local and regional traffic through Segments B and C, would result in numerous access closures and property impacts. Similar to the discussions included in **Section 2.5.2.2**, full reconstruction of the existing roadway would likely be required in order to correct the substandard geometric conditions of existing Route 220, which would likely result in substantial right of way impacts and associated construction costs.

Other Considerations

Reconstruction along existing Route 220 would be constrained by a high degree of right of way impacts, requiring complicated and costly maintenance of traffic measures as well as traffic movement disruptions and access interruptions to residences and businesses along Route 220.

These traffic disruptions and access interruptions would likely remain for a large duration of the reconstruction along existing Route 220. The disruption of traffic movements along Route 220 would inhibit the ability of residents and commuters to access local businesses. Communities located along either side of Route 220 would continue to be bisected by a busy roadway that carries a high percentage of truck traffic. As part of the reconstruction of Route 220, access to either side of the roadway would become increasingly difficult.

The APP encourages innovative strategies to implement safety and capacity improvements on arterial highways throughout the Commonwealth of Virginia. While APP implementation strategies may offer localized benefits to preserve the existing conditions of the Route 220 corridor, they are typically considered near-term operational improvements and would likely focus primarily on signal timing improvements within the study area. These localized improvement options would not address the Purpose and Need for the study for accommodating both regional and local traffic. This option would not meet the Purpose and Need and was not retained for detailed study. There were no objections to this recommendation from the agencies involved in the study and, as a result, Access Management Options and Arterial Preservation were eliminated from further consideration following the September 2019 agency coordination meeting.

2.4.4.4 Eastern Route Options

Following the identification and recommendation of Alternative C as the Preferred Alternative, VDOT and FHWA initiated a public comment period between July and August 2019 to solicit input on the Preferred Alternative (Alternative C). Accompanying the comment period, a Public Hearing was also conducted on August 15, 2019 to present the Preferred Alternative and provide an opportunity for public input. Comments submitted to VDOT during the August 2019 comment period on the recommendation of a Preferred Alternative also suggested that an alignment option east of existing Route 220 should be retained for evaluation in this Draft EIS. Similar to Alignment Options 5A through 5D and as discussed in **Section 2.2.2** through **Section 2.2.4,** options to the east of existing Route 220 would not eliminate conflicts between regional and local traffic and would not accommodate regional traffic, as traffic data demonstrates the need for a westerly movement from Route 220. Based on the inability of the eastern options (5A through 5D) to address the study's Purpose and Need, these options were not retained as part of the range of alternatives to be evaluated in this Draft EIS. There were no objections to this recommendation from the agencies involved in the study and, as a result, the Eastern Route Options were eliminated from further consideration following the September 2019 agency coordination meeting.

2.4.4.5 Hybrid Options

As discussed in **Section 2.1**, a reasonable range of alternatives was developed for the Martinsville Southern Connecter Study and presented in this Draft EIS. Agencies concurred on the range of alternatives during the March 2019 agency meeting. The identification and evaluation of a reasonable range of alternatives is consistent with FHWA's Technical Advisory *T6640.8A Guidance for Preparing and Processing Environmental and Section 4(f) Documents* (FHWA 1987). Following the identification and recommendation of Alternative C as the Preferred Alternative, VDOT and FHWA initiated a public comment period between July and August 2019 to solicit input on the Preferred Alternative (Alternative C). Accompanying the comment period, a Public Hearing was also conducted on August 15, 2019 to present the Preferred Alternative and provide an opportunity for public input. Comments submitted to VDOT during the August 2019 Public Hearing comment period suggested that VDOT evaluate potential hybrid combinations of the alternatives retained for detailed evaluation in this Draft EIS, which are described in **Sections 2.3.4** through **2.3.6** (Alternatives A, B, and C). Of these alternatives, based on public comment and concurrence by USACE and EPA, CTB has identified Alternative C as the Preferred Alternative. As part of the concurrence on the Preferred Alternative, VDOT, FHWA, USACE, and

EPA agreed that modifications or shifts in the Preferred Alternative may be evaluated in the Final EIS and JPA to minimize impacts (see **Section 2.4.6.4**).

2.5 COST ESTIMATES

A preliminary construction cost estimate, including anticipated right of way and utility costs for the alternatives (including the Preferred Alternative), were developed using the VDOT Project Cost Estimating System (PCES). Estimated construction costs for each alternative were calculated using the PCES spreadsheet and project quantities that could be estimated at this time. A cost for preliminary engineering, including the final design and preparation of the final plans, specifications, and estimate; permitting; advertisement; and bidding is included in the estimated construction cost. The spreadsheets detailing the methodology and assumptions, material quantities, and costs for each alternative may be found in the ***Alternatives Analysis Technical Report*** (VDOT, 2020b). A summary of the estimated construction, right of way, and utility costs is provided in **Table 2-10**.

Table 2-10: Total Estimated Costs

Alternative	Cost Item	Estimated Cost
Alternative A	Construction and Preliminary Engineering	$737,220,000
	Right of Way	$16,970,000
	Utilities	$3,150,000
	Total Alternative A	**$757,340,000**
Alternative B	Construction and Preliminary Engineering	$713,020,000
	Right of Way	$29,860,000
	Utilities	$3,000,000
	Total Alternative B	**$745,840,000**
Alternative C (Preferred Alternative)	Construction and Preliminary Engineering	$584,550,000
	Right of Way	$28,980,000
	Utilities	$2,380,000
	Total Alternative C	**$615,910,000**

Note: Shaded rows denote Preferred Alternative.

CHAPTER 3

Affected Environment & Environmental Consequences

3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1 INTRODUCTION / ISSUES IDENTIFICATION

The implementation of transportation improvements has the potential to affect social, economic, and natural resources; it is important that the existing environmental conditions and the potential environmental consequences are identified and understood. This chapter presents the existing environmental conditions (affected environment) of the resources and potential impacts (environmental consequences) of the No-Build Alternative, in comparison to Build Alternatives retained for detailed evaluation. Potential impacts of these alternatives are described under each resource heading and summarized in **Table 3-1**. Each resource subsection also includes information regarding potential mitigation efforts, if necessary and applicable to avoid or minimize impacts to the resources evaluated.

Table 3-1: Summary of Potential Environmental Impacts

Category	Element/Resource Assessed	Alternatives Retained for Detailed Evaluation		
		A	B	C (Preferred Alternative)
Operational Characteristics	Length (mi.)	8.3	7.7	**7.4**
	New/Modified Interchanges (no.)	3	3	**3**
	Railroad Crossings (no.)	1	1	**1**
	Access Controlled (Y/N)	Y	Y	**Y**
Relocations and Property Acquisitions	Residential Properties Impacted (no.)	50	119	**121**
	Residential Acres Impacted (ac.)	64	82	**85**
	Residential Relocations (no.)	17	26	**25**
	Industrial Properties Impacted (no.)	3	6	**6**
	Industrial Acres Impacted (acres)	2	48	**48**
	Industrial Relocations (no.)	0	4	**3**
	Commercial Properties Impacted (no.)	0	0	**0**
	Other Potential Relocations (no.)†	1	1	**1**
Land Use	Conversion of Land (ac.)	574	584	**541**
	Prime Farmland and Farmland of Statewide Importance Converted (ac.)	264	346	**298**
Socioeconomics	Community Facilities Affected (no.)	1	3	**3**
	Relocations within Minority Census Block Groups (no.)	3	9	**9**
	Low Income Census Block Groups (no.)	0	0	**0**
Historic Properties	Resources Listed, Eligible, or Recommended Eligible‡ (no.)	4	5	**3**

Category	Element/Resource Assessed	Alternatives Retained for Detailed Evaluation		
		A	B	C (Preferred Alternative)
Natural Resources	Streams (linear feet)	28,998	20,548	**21,882**
	Floodplain (ac.)	7.0	13.7	**7.5**
	Wetlands (ac.)	7.8	5.9	**3.7**
	Forest Clearing (ac.)	318	261	**224**
Air Quality	Violations of National Ambient Air Quality Standards (no.)	0	0	**0**
Noise	Existing (2018) Noise Receptors Affected (no.)	9	17	**11**
	Design Year (2040) Noise Receptors Affected (no.)	17	36	**26**
	Barriers Found Reasonable and Feasible (no.)	0	0	**0**
Hazardous Materials	Sites of Recognized Environmental Concern (no.)	5	8	**8**
Visual Quality	Viewsheds Impacted (no.)	30	100	**100**
Cost	Preliminary Cost Estimate (million $)**	$757.3	$745.8	**$615.9**

Note: Shaded column denotes Preferred Alternative.
† Includes: Institutional and Cemeteries
‡ Number of Properties on or eligible for the National Register of Historic Places (NRHP)
*** Includes cost assumptions for preliminary engineering, right of way and utilities, and construction.*

There are several boundaries that were used to identify environmental resources and evaluate potential impacts.

- Study Area – The largest boundary is called the study area, which encompasses a half of a mile from each alternative retained for evaluation. This study area was used in various instances during preliminary research and is noted in the affected environment description if utilized (see **Figure 3-1**).
- Census-Based Study Area – This includes the boundary of all census block groups that intersect the alternatives retained for evaluation. This was used primarily for evaluating census and demographic data (see **Figure 3-2**).
- Alternative Inventory Corridor – This boundary extends 400 feet or greater on either side of the centerline of each Build Alternative retained for evaluation. The inventory corridor was developed primarily for field investigations and the identification of resources within a reasonable proximity of each Build Alternative as the preliminary design was developed for the illustrative planning level limit of disturbance (LOD). The inventory corridor was increased to include a minimum of 110 feet outside the planning level LOD for potential interchange locations as well as side street intersections in order to inform future detailed phases of project development for the configuration of these connections. None of the Build Alternatives would impact all of the resources identified within the inventory corridors and they do not reflect the impacts of each of the Build Alternatives in comparison to one another. Instead, the illustrative planning level LOD was developed within these inventory corridors to represent the likely footprint and potential impacts of the alternatives retained for evaluation. Additional inventory data may be needed prior to the Record of Decision (ROD) to identify avoidance and minimization opportunities for the Preferred Alternative. Additional field investigations may also be required should alignments shift or design modifications fall outside the current Alternative Inventory Corridor boundaries (see **Figure 3-3**).

Figure 3-1: Study Area

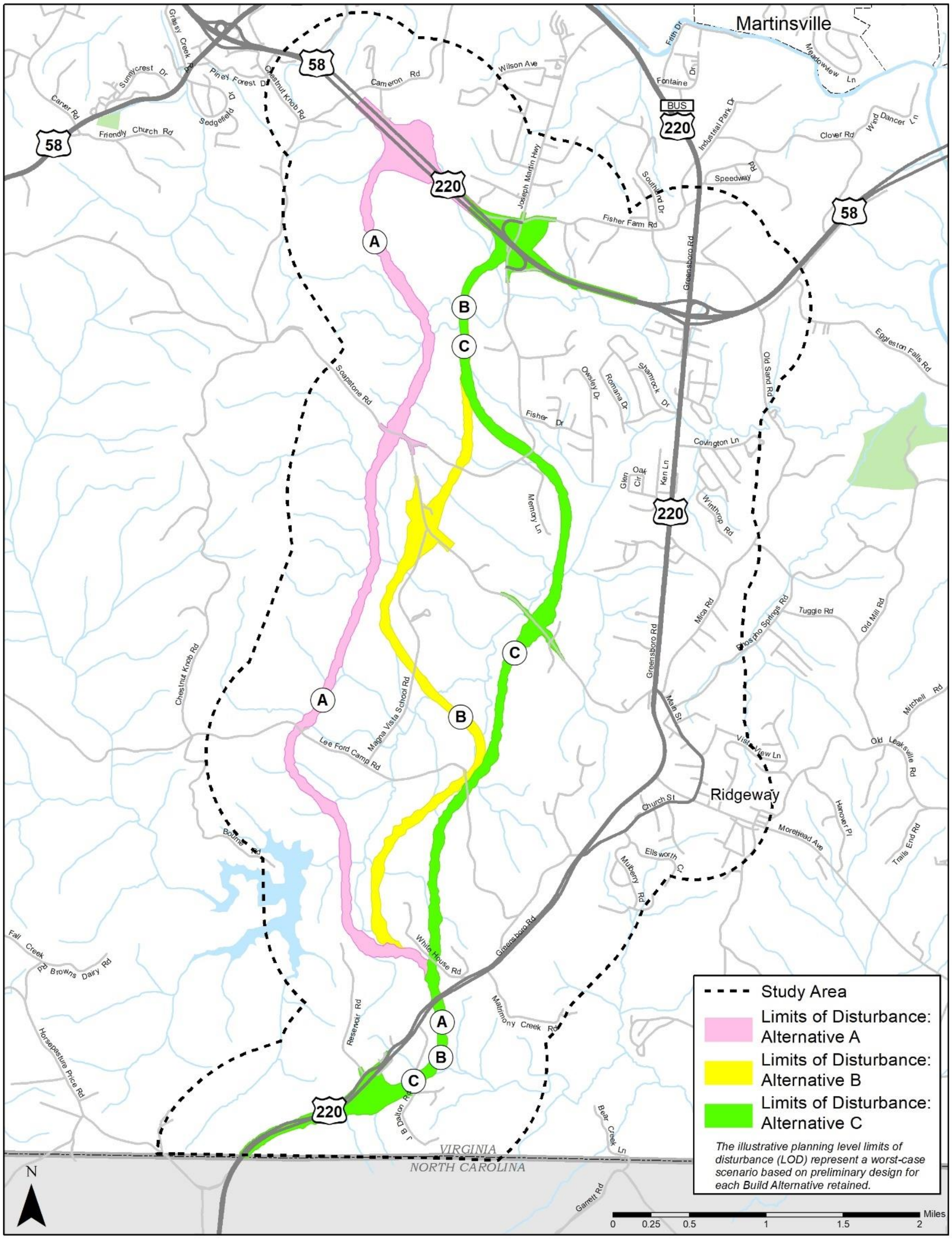


Figure 3-2: Census-Based Study Area

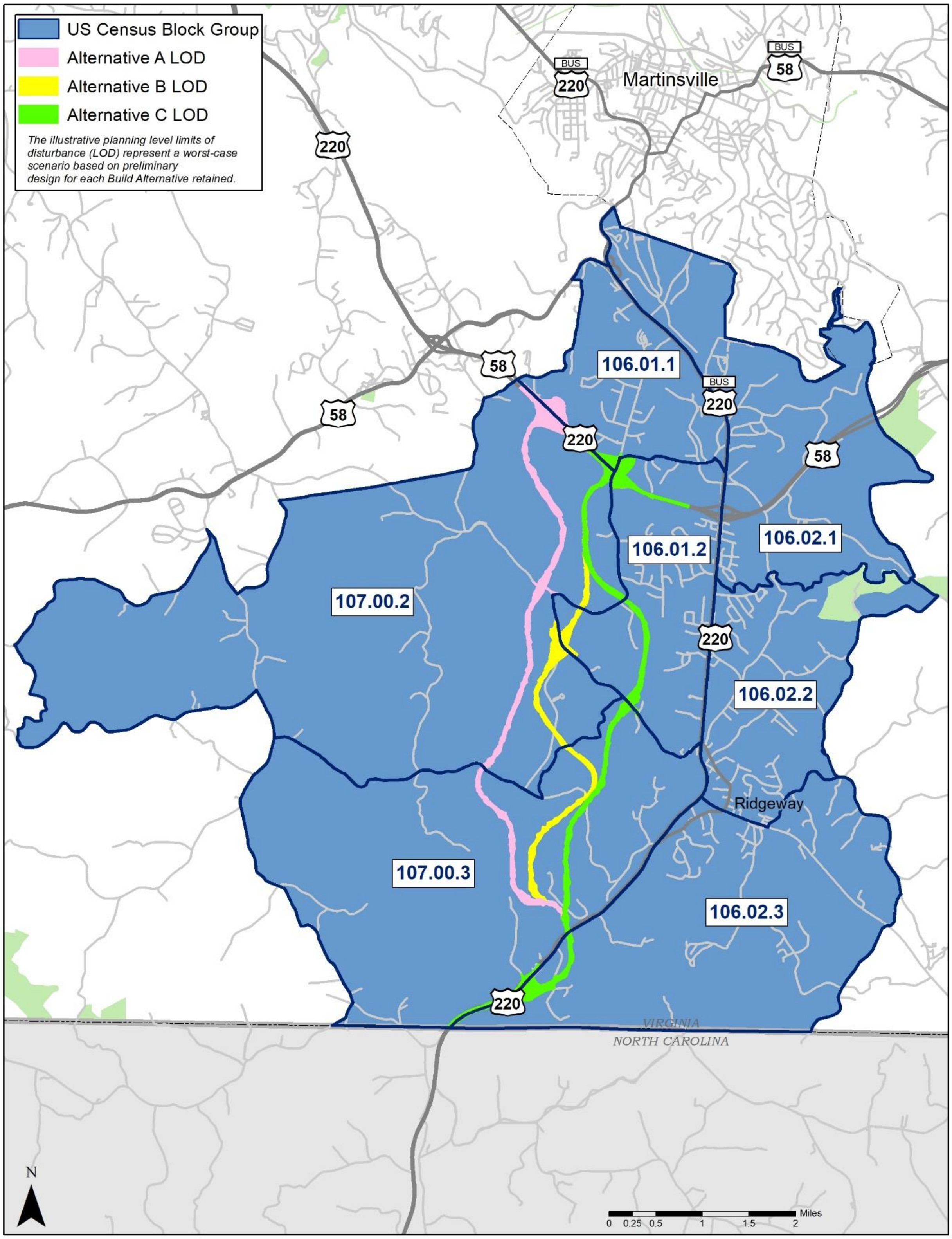
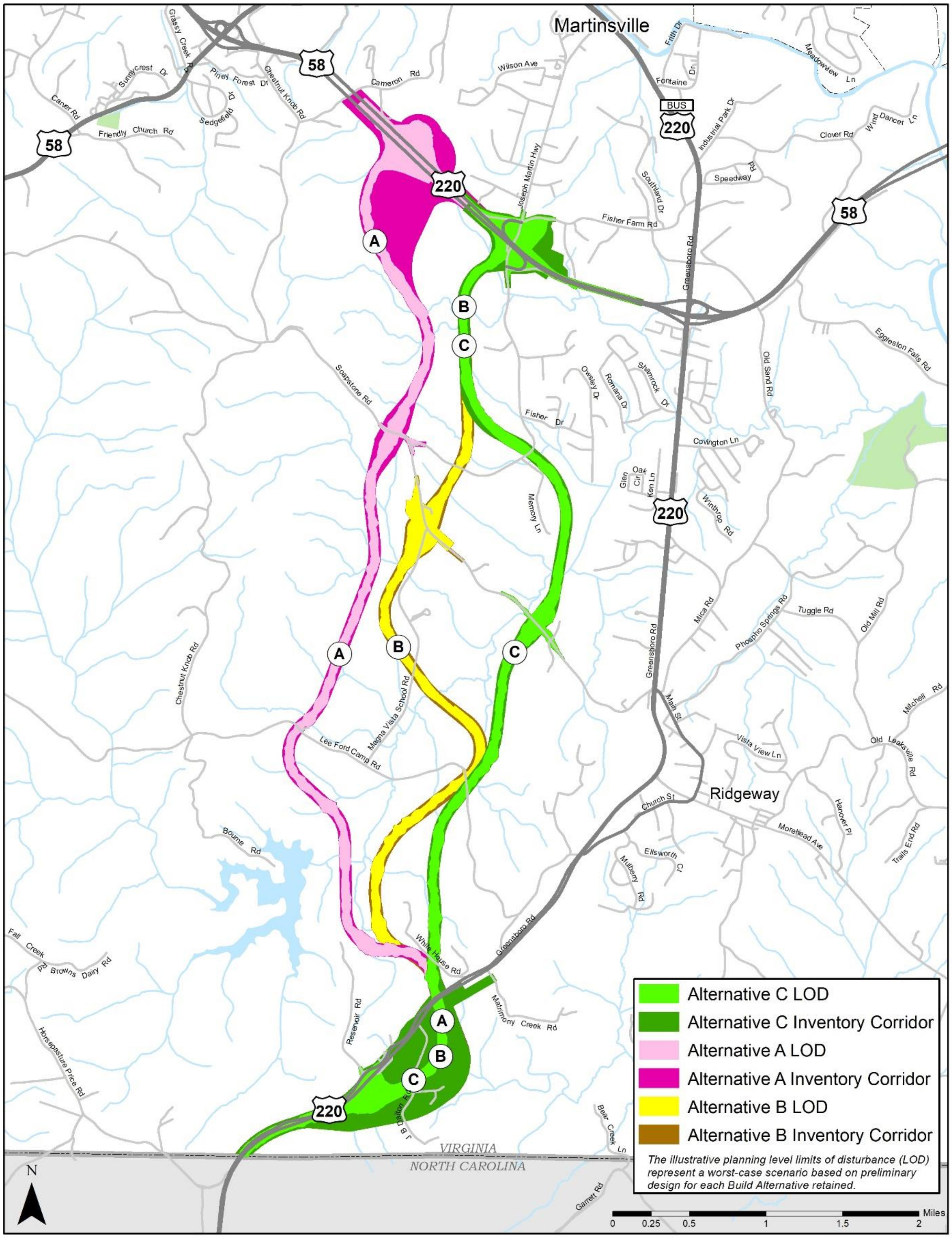


Figure 3-3: Alternative Inventory Corridors and Planning Level LODs



- Planning Level LOD – this boundary includes the worst-case LOD based on the illustrative planning level design of the Build Alternatives retained for detailed study in this Draft Environmental Impact Statement (EIS) (see **Figures 3-1**, **3-2**, and **3-3**). More detailed information on design criteria and assumptions used to develop the LODs are included in the ***Alternatives Analysis Technical Report*** (VDOT, 2020b).

As previously described, the quantification and analysis of potential impacts to environmental resources in this Draft EIS focuses primarily on the LOD for each alternative retained for evaluation.

A discussion of the environmental resources analyzed in this Draft EIS and the potential impacts associated with each Build Alternative retained for detailed evaluation is provided in the subsections that follow. Additional information on the environmental studies may be found in the following technical reports and documentation supporting the Martinsville Southern Connector Study Route 220 EIS (Martinsville Southern Connector Study) (see **Appendix D**). The following technical reports are being made available to the public for review and comment along with the Draft EIS.

- Traffic and Transportation Technical Report (VDOT, 2020a)
- Alternatives Analysis Technical Report (VDOT, 2020b)
- Socioeconomic and Land Use Technical Report (VDOT, 2020c)
- Section 4(f) Analysis (VDOT, 2020k)
- Architectural History Survey (VDOT, 2020i)
- Phase I A Archaeological Survey (VDOT, 2020h)
- Natural Resources Technical Report (VDOT, 2020d)
- Air Quality Technical Report (VDOT, 2020f)
- Noise Analysis Technical Report (VDOT, 2020g)
- Hazardous Materials Technical Report (VDOT, 2020e)
- Indirect and Cumulative Effects Technical Report (VDOT, 2020j)

3.2 SOCIOECONOMIC RESOURCES

3.2.1 Community and Community Facilities

3.2.1.1 Regulatory Context and Methodology

The study area used for identifying communities and community facilities is a half-mile buffer from the boundary of the combined planning level LODs for all of the Build Alternatives retained for evaluation. The planning level LOD for each alternative is used to evaluate potential impacts to communities and community facilities. When the LOD impacts a structure or is within 10 feet of a structure, that structure is considered a displacement (relocation) and the entire property is acquired. If the LOD intersects a property, but does not bisect the property or is not within 10 feet of a structure, it is considered a partial acquisition and the structure remains (no relocation).

Communities and community facilities were identified through use of Geographic Information Systems (GIS) data, Federal, state, and local databases, field inventory, and secondary mapping sources such as Google Maps™ and Google Earth™. Various community facilities were verified by utilizing the *Henry County Comprehensive Plan* developed by the Henry County Planning Commission (HCPC) (HCPC, 1995). Additional information regarding the methodology for identifying and analyzing potential impacts to communities and community facilities is included in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c).

The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

3.2.1.2 Affected Environment

The study area is located in Henry County, Virginia, adjacent to the City of Martinsville (Martinsville) and the Town of Ridgeway (Ridgeway). Businesses, hotels, gas stations, health services, and a local elementary school are located along the Route 220 (Joseph Martin Highway) corridor. West of Route 220, along with residential neighborhoods, the study area contains the Marrowbone Reservoir, Pace Aviation (a private airport), various churches, and the Magna Vista High School.

The neighborhoods in the northern portion of the study area, within approximately two miles of Route 58, are suburban in nature, with several streets leading off the main access roads to Route 58 and Route 220. The primary neighborhoods identified in this study include: Shannon Hills, Marrowbone Heights, Glen Court, Sheffield Terrace, and Deerfield Village. These neighborhoods are illustrated on **Figure 3-4**; however, they do not represent a comprehensive list of all the individual neighborhoods within the study area, and some smaller neighborhoods may be omitted.

The Piedmont Area Regional Transit (PART) shuttle system follows a fixed route system through parts of Martinsville and Henry County in the northern portion of the study area, with stops at high traffic retail areas, industrial parks, college campuses, medical facilities and government offices. According to the PART 2017 map of bus routes, two stops fall within the study area: the Southside Route has a stop at the Sheffield Square/Tractor Supply and at Fisher Farm Road and Joseph Martin Highway (Martinsville, 2017).

In the center of the study area, adjacent to the east of existing Route 220, is the more populated area of Ridgeway, with several neighborhoods accessed from Route 220 or Route 87 (Morehead Avenue). Ridgeway and the surrounding vicinity includes various churches and grocery stores, a post office, a library, Drewry Mason Elementary School, and local rescue and fire services. The southern portion of the study area is less dense, with neighborhoods interspersed along existing Route 220, with access provided via Lily Road and J.B. Dalton Road. Further from existing Route 220, the study area is rural in nature, with large residential lots interspersed along the local roadways that intersect the study area.

Local rescue and fire services are located in Ridgeway; however, there are no hospitals within the study area. The closest hospital is Sovah Health in Martinsville, which is accessible from Route 58 and Irisburg Road, approximately eight miles (15 minutes) north of the study area. The community facilities within the study area are shown in **Figure 3-4**. The type and number of the community facilities can be found in **Table 3-2**.

Table 3-2: Community Facilities Within the Study Area

Facility Type[1]	Number of Facilities within the Study Area
Airports	1
Cemeteries	9
Community Centers	1
Fire/Rescue Services	3
Government Offices	1
Hospitals	0
Libraries	1
Parks and Recreation	1
Places of Worship	15

Facility Type[1]	Number of Facilities within the Study Area
Post Offices	1
Reservoirs	1
Public Schools	2
Transit Bus Stops	2
Transit Services	1
Waste Disposal Facilities	1

*[1] See **Figure 3-4** for locations of the community facilities*
Sources: Henry County GIS Database, Federal/State/Local Databases maintained by VDOT, Google Maps™

There are several communities located along Route 220 and along local roads west of Route 220. The residents of these communities are connected to other communities and community facilities primarily by Route 220. In reviewing historic aerial images, most of these communities appear to have been built following the construction of Route 220 and surrounding roads (VDOT, 2020j). Currently, a high amount of regional traffic from trucks traveling from/to areas south and north, outside of the study area, utilize Route 220. This leads to a heavy mix of local and regional truck traffic that hinders accessibility to communities and community facilities located along and west of Route 220. The presence of Route 220 between the communities, coupled with the existing local and regional traffic volumes, create a barrier and fragment the communities. The fragmentation is further indicated by the travel delays on Route 220. The combined traffic adds to local delays in travel on Route 220; including delays or queue lengths at intersections with local roads (VDOT, 2020a). For example, people from the Shannon Hills community located along the west side of Route 220 at Shamrock Drive, experience a 552 second delay (over nine minutes) in the morning turning from Shamrock Drive to Route 220. In addition, there is an observable queue of cars backed up onto Route 220 in the afternoon waiting to pick up children at the Drewry Mason Elementary School. These travel delays and backups impair cohesion of communities and connectivity of communities and community facilities. Additionally, residences and community facilities near Route 220 experience associated traffic noise that can be disruptive to community cohesion. The assessment of noise is discussed in the ***Noise Technical Report*** (VDOT, 2020g).

Figure 3-4: Communities and Community Facilities

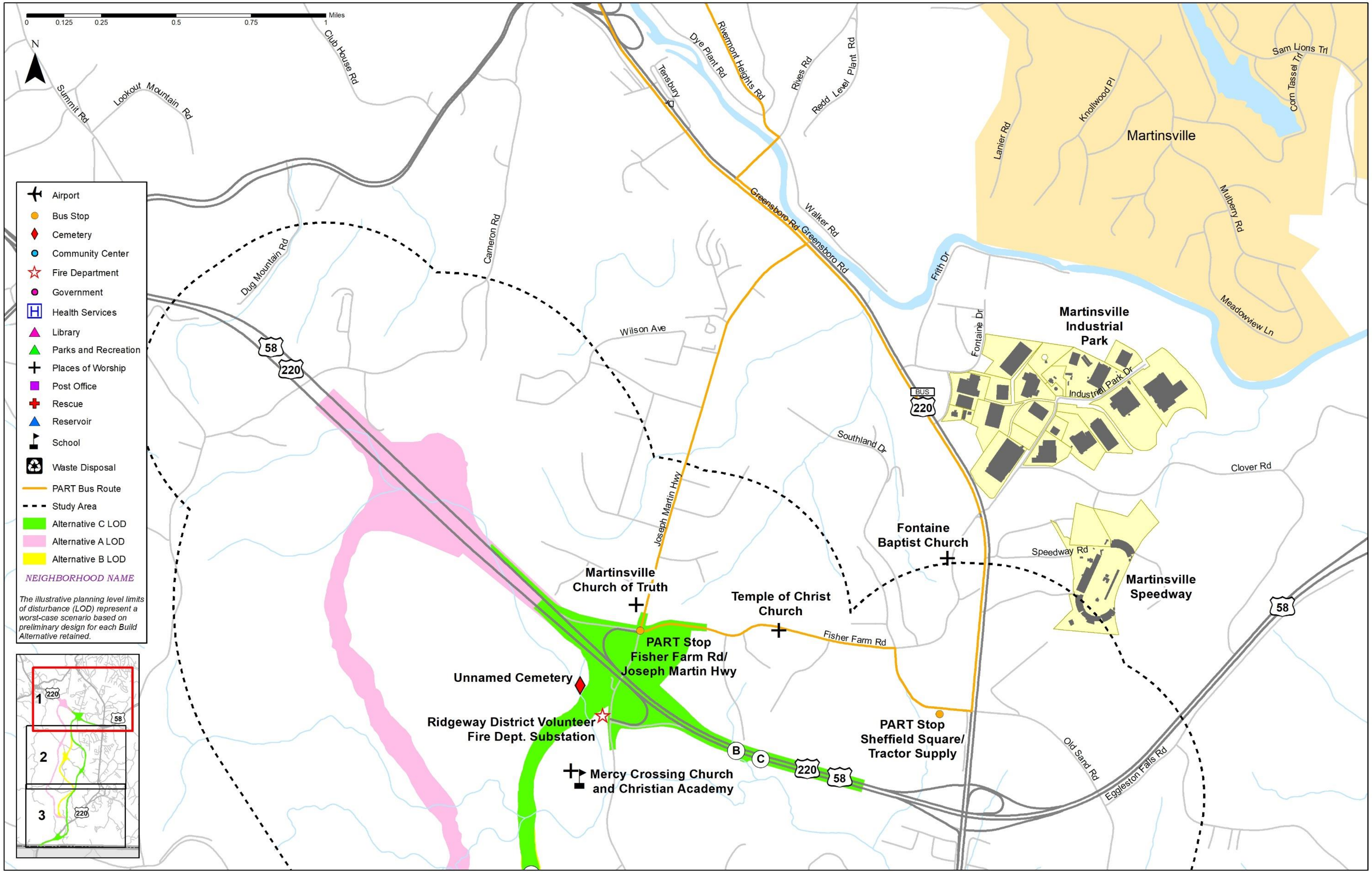


Figure 3-4: Communities and Community Facilities (cont.)

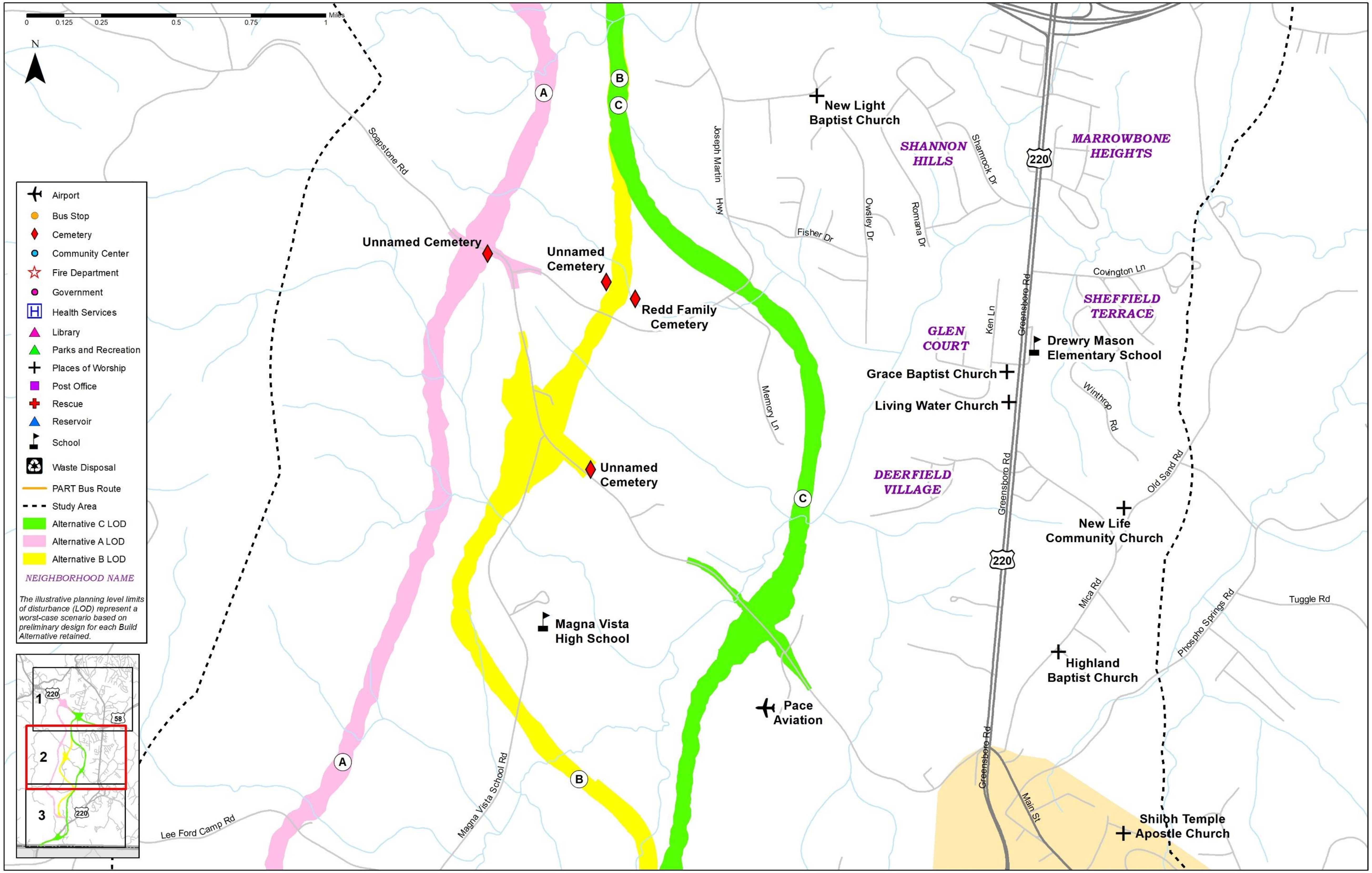
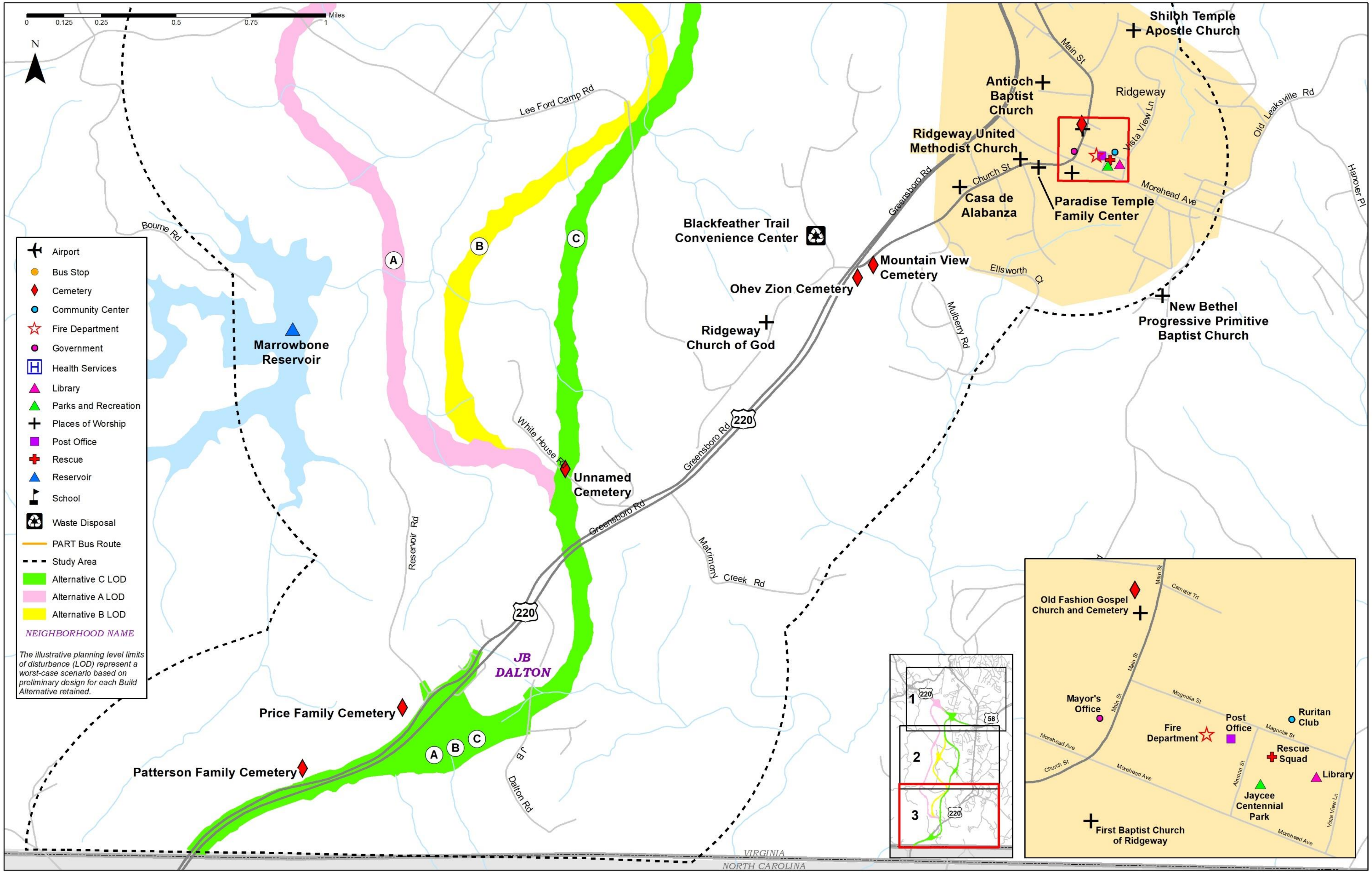


Figure 3-4: Communities and Community Facilities (cont.)



3.2.1.3 Environmental Consequences

No-Build Alternative

The No-Build Alternative would have no direct impacts on the communities and community facilities within the study area. Since Route 220 serves both as a freight route and a route to businesses, homes, schools, and recreational areas, it is utilized by both local and regional traffic. Route 220 would continue to represent a physical barrier between the communities and community facilities and the increased traffic volume would emphasize the fragmentation and further contribute to traffic delays. The combined traffic volumes and truck percentages and associated traffic delays experienced by local people would additionally continue to hinder access and the ability to travel to community facilities and other local destinations, causing communities along the route to further experience community fragmentation effects and reduced community cohesion. Subsequently, the heavy mix of local and regional truck traffic that exists today and fragments the communities and community facilities, in addition to the associated traffic delays and backups, which adversely impact community cohesion and accessibility, would continue and worsen under the No-Build condition.

Alternative A

Alternative A would be constructed west of Ridgeway in a primarily rural area and may impact a sense of community between homes. Under Alternative A, the new alignment roadway would be access controlled and would not function as a local access road, but instead would principally provide arterial service to regional through traffic movements. While the new roadway would be grade separated from existing roadway facilities in the study area, including Route 688 (Lee Ford Camp Road) and J.B. Dalton Road, allowing for local traffic to flow unimpeded, the new roadway would create a physical barrier between areas that were formerly adjacent to one another. The physical barrier of the roadway may result in a loss of community cohesion by separating these communities from their current surroundings. Alternative A would also affect communities proximate to the new roadway through the introduction of a new noise source and visual intrusions. Under Alternative A, a new interchange would be constructed at Soapstone Road, therefore, the existing viewshed of the communities near Soapstone Road would be modified due to the introduction of a new roadway facility and the associated interchange access point. Additionally, the change to the viewshed has the potential to fragment the surrounding communities.

By providing a new alignment for regional truck traffic, Alternative A would remove regional traffic from Route 220. By reducing the traffic on Route 220 and subsequently reducing delays at signalized intersections, local travelers would benefit from additional reliability to access schools and other community facilities, allowing for communities to connect to local destinations and other neighborhoods, enhancing community cohesion. Accessibility and travel times would be improved for people traveling to and from communities and community facilities located along and near Route 220, because the amount of mainline traffic would decrease. The decrease in mainline traffic volumes would reduce the intersection travel delay times and queue lengths, improving access to Route 220 from side streets and businesses. The reduction in traffic would decrease community fragmentation through reduced delay times and would improve community cohesion. This travel time saving applies to emergency vehicles as well with improved access to and from communities along Route 220 through reduced delay times due to the lower volume of traffic. In addition, emergency response may be improved to the communities west of Route 220 through use of the new roadway and interchange provided at Soapstone Road. Alternative A would provide a secondary north/south roadway for emergency vehicles to access points along and within the study area. Alternative A would potentially impact an unnamed cemetery along Soapstone Road.

Alternative B

Alternative B would be constructed west of Ridgeway in a primarily rural area and may impact a sense of community between homes. Under Alternative B, the new alignment roadway would be access controlled and would not function as a local access road, but instead would principally provide arterial service to regional through traffic movements. While the new roadway would be grade separated from the existing roadways it intersects, including Joseph Martin Highway, Magna Vista School Road, Lee Ford Camp Road, and J.B. Dalton Road, allowing for local traffic to flow unimpeded, the new roadway would create a physical barrier between areas that were formerly adjacent to one another. The physical barrier of the roadway may result in a loss of community cohesion by separating these communities from their current surroundings. However, the new roadway facility would maintain access to Magna Vista High School. Alternative B would also affect communities proximate to the new roadway through the introduction of a new noise source and visual intrusions. Under Alternative B, a new interchange would be constructed at Soapstone Road, therefore, the existing viewshed of the communities near Soapstone Road would be modified due to the introduction of a new roadway facility and the associated interchange access point. Additionally, the change to the viewshed has the potential to fragment the surrounding communities.

By providing a new alignment for regional truck traffic, Alternative B would remove regional traffic from Route 220. Presently, the combined traffic volume and truck percentages and associated traffic delays experienced by local people hinders access and the ability to travel to community facilities and other local destinations, causing communities along the route to experience fragmentation effects and reduced community cohesion. By utilizing Alternative B which would reduce the traffic on Route 220 and subsequently reduce delays at signalized intersections, local travelers would benefit from additional reliability to access to schools and other community facilities, additionally allowing for communities to connect to local destinations and other neighborhoods, enhancing community cohesion. Accessibility and travel times would be improved for people traveling to and from communities and community facilities located along and near Route 220 due to the decrease in mainline traffic. The decrease in mainline traffic volumes would reduce the intersection travel delay times and queue lengths, improving access to Route 220 from side streets and businesses. The reduction in traffic would decrease community fragmentation through reduced delay times and would improve community cohesion. This travel time saving applies to emergency vehicles as well with improved access to and from communities along Route 220 through reduced delay times due to the lower volume of traffic. In addition, emergency response may be improved to the communities west of Route 220 through use of the new roadway and interchange provided at Soapstone Road. Alternative B would provide a secondary north/south roadway for emergency vehicles to access points along and within the study area.

Alternative B could impact portions of the Ridgeway District Volunteer Fire Department Substation property and Mercy Crossing Church/Christian Academy property, but would not require relocation of either of the properties. There also could be a minor property impact to the southwest corner of the Magna Vista High School property, which would not impact school activities/functions. Alternative B would impact an unnamed cemetery along Soapstone Road. If any improvements from the Martinsville Southern Connector Study advance to design, efforts to minimize and reduce right of way impacts to these properties, in addition to other private properties, would be made. Additionally, compensation in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970* (as amended, 1987) would be provided, if necessary; additional discussion on mitigation is located in **Section 3.2.1.4**.

Alternative C (Preferred Alternative)

Alternative C would be constructed west of Ridgeway in a primarily rural area. There are several homes surrounding the interchange of Joseph Martin Highway and Route 58 that would potentially be relocated as part of the reconfiguration of this interchange under Alternative C. However, the reconfiguration of this interchange would not cause a disruption in community cohesion beyond what is already experienced by the existing communities in proximity to the existing interchange. Alternative C could impact a sense of community between homes proximate to the new roadway. Under Alternative C, the new alignment roadway would be access controlled and would not function as a local access road, but instead would principally provide arterial service to regional through traffic movements. While the new roadway would be grade separated from the existing roadways it intersects, including Joseph Martin Highway, Lee Ford Camp Road and J.B. Dalton Road, allowing for local traffic to flow unimpeded, the new roadway would create a physical barrier between areas that were formerly adjacent to one another. The physical barrier of the roadway may result in a loss of community cohesion by separating these communities from their current surroundings. Alternative C would also affect communities proximate to the new roadway through the introduction of a new noise source and visual intrusions. Under Alternative C, a new interchange would be constructed at Soapstone Road, therefore, the existing viewshed of the communities near Soapstone Road would be modified due to the introduction of a new roadway facility and the associated interchange access point. Additionally, the change to the viewshed has the potential to fragment the surrounding communities.

By providing a new alignment for regional truck traffic, Alternative C would remove regional traffic from Route 220. Presently, the combined traffic volume and truck percentages and associated traffic delays experienced by local residents hinders access and the ability to travel to community facilities and other local destinations, causing communities along the route to experience fragmentation effects and reduced community cohesion. By utilizing Alternative C, which would reduce the traffic on Route 220 and subsequently reduce delays at signalized intersections, local travelers would benefit from additional reliability to access to schools and other community facilities, as well as allowing for communities to connect to local destinations and other neighborhoods, enhancing community cohesion.

Accessibility and travel times would be improved for people traveling to and from communities and community facilities located along and near Route 220 due to the decrease in mainline traffic. The decrease in mainline traffic volumes would reduce the intersection travel delay times and queue lengths, improving access to Route 220 from side streets and businesses. The reduction in traffic would decrease community fragmentation through reduced delay times and would improve community cohesion. This travel time saving applies to emergency vehicles as well with improved access to and from communities along Route 220 through reduced delay times due to the lower volume of traffic. In addition, emergency response may be improved to the communities west of Route 220 through use of the new roadway and interchange provided at Soapstone Road. Alternative C would provide a secondary north/south roadway for emergency vehicles to access points along and within the study area.

Alternative C would impact portions of the Ridgeway District Volunteer Fire Department Substation property and Mercy Crossing Church/Christian Academy property, but would not require relocation of either of the properties. Alternative C would be located parallel to Pace Aviation and would avoid impacts to the runway; however, if this alternative is selected, additional coordination would be needed to ensure that all safety and operational requirements for the airport are met. Alternative C would impact an unnamed cemetery along White House Road.

3.2.1.4 Mitigation

Impacts to the use and functionality of these impacted community facilities would be coordinated during the right of way acquisition process for any improvements that advance from the Martinsville Southern Connector Study and would be minimized to the greatest extent practicable as part of more detailed design. The potential impacts were evaluated at a planning level, the final property impacts would be dictated by the final design and prior to the placement of construction features. Affected property owners would be compensated for the fair market value of the acquired portion of land and structures acquired for the construction of the Preferred Alternative in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act* of 1970.

Since all of the Build Alternatives would impact a cemetery, there is potential that the relocation of a cemetery would be required. In instances where an alternative would relocate a cemetery, disinterment of human burials would proceed under a court order for the removal of graves, a permit for the archaeological recovery of human remains issued by the Virginia Department of Historic Resources (VDHR), or with a permit issued by the local health department. This latter permit, intended for disinterment, transport, and reinternment of recent bodies to and from active cemeteries has been used as an alternative to the court order and the archaeological permit processes.

Amended and reenacted Virginia Code (§§ 57-36 and 57-38.1) requires local governments (any county, city, or town) to consider avoidance of adverse impacts to abandoned cemeteries on properties that are acquired by and intended to be developed by the local government prior to completion of development plans. The local governments are required to engage in active public notice and participation regarding efforts to avoid adverse impacts to the graveyard or to remove the remains interred in such graveyard to an alternative repository and make a good faith effort to identify and contact living descendants of the person buried in the graveyard. Public notification efforts would include at least one notice published in a locally circulating newspaper. Additionally, notice would be posted at the site of the graveyard and at least one public meeting would be held. Consultation with any local historic preservation commission and historical and genealogical societies would be required.

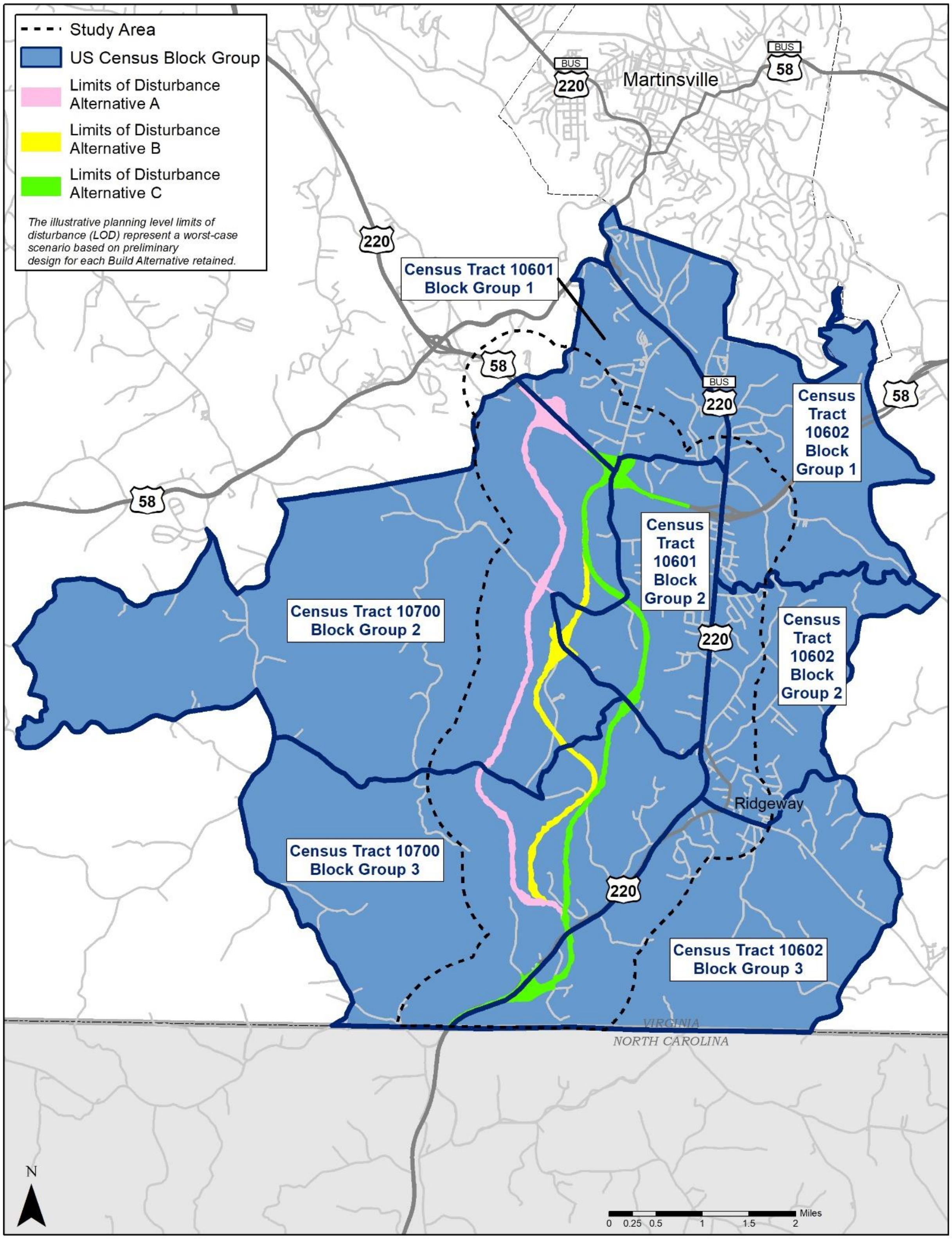
3.2.2 Population and Housing

3.2.2.1 Regulatory Context and Methodology

Resident population and housing characteristics have been estimated based on data from the U.S. Census Bureau's American Community Survey (ACS). For this analysis, 2012-2016 ACS 5-Year Estimates were used. Although ACS data is less accurate than the census, because the most recent census (2010) is nine years old, the more recent data is appropriate to use (2012-2016). The ACS data sources are the most comprehensive recent published data sources and are relied on by the Virginia Department of Transportation (VDOT) and the Federal Highway Administration (FHWA) for comprehensive analyses. The data for all block groups that have the potential to be impacted by the alternatives retained for evaluation have been combined to create a Census-based study area for comparing against individual block group data during analysis. **Figure 3-5** shows the census block groups and their proximity to each alternative.

Although 2013-2017 ACS 5-Year data profiles are available through the U.S. Census Bureau, the Environmental Protection Agency (EPA)'s Environmental Justice Screening and Mapping Tool (EJSCREEN) was used to obtain specific block group summary reports, which currently utilizes 2012-2016 ACS data. Additionally, data from the 2017 West Piedmont Economic Development District's 2017 Regional Comprehensive Economic Development Strategy was used to illustrate population projections in Henry County.

Figure 3-5: Census Block Groups and Alternatives



The planning level LOD for each alternative was used to evaluate potential impacts to population and housing. When the LOD intersects or is within ten feet of a structure, that structure was considered a displacement (relocation) and the entire property was assumed to be acquired. If the LOD encompassed a portion of a property but did not intersect or fall within ten feet of a structure, it was considered a partial property acquisition and the structure was assumed to remain (no displacement or relocation). The planning level LOD is based on the illustrative planning level design of the Build Alternatives; therefore, the potential relocations and property acquisitions identified as part of this analysis are intended to represent worst-case impacts to resources. Opportunities to minimize these potential environmental consequences could be evaluated as part of more detailed design phases for any future improvements that may advance from the Martinsville Southern Connector Study. For more information, see the ***Socioeconomic and Land Use Technical Report*** (VDOT 2020c).

The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

3.2.2.2 Affected Environment

Population

According to ACS 5-Year Estimates (2012-2016), the current resident population within the study area is 7,849. **Table 3-3** presents population information for each census block group within the study area, as well as several localities and statewide information for reference. The most populated census block group (Census Tract 106.02 Block Group 2) is located along Route 220 and includes the Marrowbone Heights and Sheffield Terrace neighborhoods, as well as a portion of Ridgeway. The lowest populated census block group (Census Tract 107 Block Group 2) is located west of Route 220 and is mainly rural. The Census-based Study Area population (7,849) is approximately 15 percent of the population of Henry County (52,209) and less than one percent of the statewide population (8,310,301).

Table 3-3: Population by Census Block Group and Locality

Location	Total Population
Census Tract 106.01 Block Group 1	1,303
Census Tract 106.01 Block Group 2	1,479
Census Tract 106.02 Block Group 1	807
Census Tract 106.02 Block Group 2	1,614
Census Tract 106.02 Block Group 3	1,562
Census Tract 107 Block Group 2	517
Census Tract 107 Block Group 3	567
Study Area	7,849
Town of Ridgeway	813
City of Martinsville	13,551
Henry County	52,209
Virginia	8,310,301

Source: *U.S. Census Bureau, American Community Survey 2012-2016*.

According to the Weldon Cooper Center for Public Service's Demographics Research Group, between 2010 and 2018, the population of Henry County declined to 64,557, a five percent decrease. The population of Henry County is projected to further decrease to 53,744 by 2040. The population is expected to continue to decrease in both Henry County and Martinsville (WCCPS, 2019). For more information on population projections, refer to the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j).

Housing

Table 3-4 presents housing information for each Census block group within the study area, as well as several localities and statewide information, for reference. Approximately 3,869 total housing units are within the Census-based study area, with 88 percent of homes being occupied (3,387). The largest amount of total housing units within the Census-based study area are within Census Tract 106.01 Block Group 1. Of the occupied houses, 76 percent are owner-occupied (2,561) and 24 percent are renter-occupied (826). No block groups have more renters than owners. There are approximately 22,136 occupied housing units within Henry County and 3,090,178 occupied housing units statewide. Total occupied housing units within the study area account for 15 percent of Henry County and less than one percent of all occupied housing units in Virginia.

Table 3-4: Housing Characteristics

Location	Total Housing Units	Total Occupied Housing Units	Owner-Occupied	Renter-Occupied
Census Tract 106.01 Block Group 1	744	646	445	201
Census Tract 106.01 Block Group 2	645	591	481	110
Census Tract 106.02 Block Group 1	525	423	293	130
Census Tract 106.02 Block Group 2	648	621	505	116
Census Tract 106.02 Block Group 3	728	602	415	187
Census Tract 107 Block Group 2	292	264	251	13
Census Tract 107 Block Group 3	287	240	171	69
Study Area Total	**3,869**	**3,387**	**2,561**	**826**
Ridgeway	360	320	242	78
Martinsville	7,159	5,787	3,061	2,726
Henry County	26,117	22,136	16,253	5,883
Virginia	3,445,357	3,090,178	2,032,761	1,057,417

Source: *U.S. Census Bureau, American Community Survey 2012-2016*.

3.2.2.3 Environmental Consequences

No-Build Alternative

The No-Build Alternative would not result in any project-related construction and would therefore have no direct impacts on population or housing. However, as discussed above, the population of Henry County and Martinsville is projected to decrease between 2018 and 2040 (WCCPS, 2019). The existing conditions that are impacting the population and housing in the area, including traffic delays associated with the lack of accommodation for regional and local traffic, would continue to worsen in the No-Build condition and could contribute to the projected decrease in population.

Alternative A

Alternative A could potentially impact 64 acres of residential land within 50 residential properties. Of the 50 potentially impacted residential properties, 17 residential properties would require potential relocation due to the planning level LOD of Alternative A crossing within ten feet of the structure on the property. **Table 3-5** summarizes the potential residential property impacts, potential total residential land acres impacted, and potential residential relocations associated with the Build Alternatives. Potential total residential acres impacted represent the area where the planning level LOD of each alternative overlaps a residential parcel. Relocations were assumed where the planning level LOD encompasses a structure or is within ten feet of an existing structure. The planning level LOD is based on the illustrative planning level design of alternatives retained for evaluation and accounts for the worst-case impacts to resources.

Table 3-5: Estimated Residential Impacts

Residential Impact	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Estimated Number of Residential Properties Impacted	50	119	121
Estimated Residential Acres Impacted	64	82	85
Estimated Residential Relocations	17	26	25

Note: Shaded column denotes Preferred Alternative.

Eight of the potential relocations under Alternative A are estimated to be concentrated in two locations: six within the J.B. Dalton neighborhood and two are at the new interchange with Route 687 (Soapstone Road). The remaining nine are scattered along the alignment and at the two tie in locations: one residence adjacent to Lee Ford Camp Road, two residences adjacent to White House Road, and six residences along Route 220 as Alternative A ties into the existing roadway.

Alternative B

Alternative B could potentially impact 82 acres of residential land within 119 residential properties. Of the 119 potentially impacted residential properties, 26 residential properties would require potential relocation due to the planning level LOD of Alternative B crossing within ten feet of the structure on the property (see **Table 3-5**). Of the potential relocations, ten are estimated to be concentrated in two locations: six within the J.B. Dalton neighborhood and four residences at the new interchange with Soapstone Road. The remaining 16 are scattered along the alignment and at the two tie in locations: one residence along Ravenswood Lane, one along Lee Ford Camp Road, two residences along White House Road, six (residences along Route 220 as Alternative B ties into the new alignment at the southern end of the study area, and six residences along Route 58 as Alternative B ties into the existing roadway at the northern end of the study area.

Alternative C (Preferred Alternative)

Alternative C could potentially impact 85 acres of residential land within 121 residential properties. Of the 121 potentially impacted residential properties, 25 residential properties would require potential relocation due to the planning level LOD of Alternative C crossing within ten feet of the structure on the property (see **Table 3-5**). Six of the potential relocations are estimated to be concentrated in the J.B. Dalton neighborhood. The remaining 19 are scattered along the alignment and at the two tie in locations: one residence along Ravenswood Lane, two residences along Memory Lane, one residence along Red Fox Road, one residence along Soapstone Road, two residences along Fisher Farm Road, six residences along Route 220 as Alternative C ties into the new alignment at the southern end of the study area, and six residences along Route 58 as Alternative C ties into the existing roadway at the northern end of the study area.

3.2.2.4 Mitigation

Currently, there appears to be adequate available housing in the study area corridors given the difference between total housing units and total occupied housing units identified in **Table 3-4**. A determination on the availability of adequate housing would be made during detailed design. Additionally, refinements made in the Final EIS or following the National Environmental Policy Act (NEPA) process could further reduce property impacts as the detailed design for the Preferred Alternative is completed. The potential impacts were evaluated at a planning level, the final property impacts would be dictated by the final design and placement of construction features.

All affected property owners would be compensated for the fair market value of the acquired portion of land and any structures acquired for the construction of the Preferred Alternative. VDOT's *Right of Way Manual of Instructions*, updated January 2016, indicates that after any improvements have been planned and all requirements have been met, property owners would be notified, the property would be appraised accordingly, and just compensation would be offered and would never be less than the fair market value (VDOT 2016). Any individual, family, business, farm, or non-profit organization displaced as a result of the acquisition of real property is also eligible to receive reimbursement for moving costs. This process is known as relocation assistance.

In accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act* of 1970 (as amended), displaced property owners would be provided relocation assistance advisory services together with the assurance of the availability of decent, safe, and sanitary housing. Relocation resources would be made available to all displaced persons without discrimination. Additionally, property owners would be able to consult VDOT's *A Guide for Property Owners and Tenants*, an information packet for property owners which provides information on VDOT's process of acquiring rights of way for public improvement projects.

3.2.3 Economic Resources

3.2.3.1 Regulatory Context and Methodology

Economic data, including industry sectors, revenue, employment, median family income, and commuting patterns, was compiled from the Virginia Employment Commission (VEC) and associated applications (*OnTheMap* U.S. Census Bureau application for commuting patterns), the U.S. Census Bureau's 2012-2016 ACS 5-Year Estimates, and the Virginia Department of Taxation, when necessary.

2012-2016 data was used for population and housing since pertinent information was available via EJSCREEN (EPA 2019), which utilized the 2012-2016 ACS 5-Year dataset. For consistency, 2012-2016 data for employment and income based on individual block groups was also used in this section. VEC data from 2018 was utilized to identify the most current top five largest employers in Henry County. A majority of the economic data is based on Henry County as a whole. Individual block group data was reported, if available.

The data for all block group locations that have the potential to be impacted by new alternatives have been combined to create a Census-based Study Area for income and employment.

The planning level LOD for each alternative was used to evaluate potential impacts to commercial and industrial properties and economic resources. The planning level LOD for each alternative was used to evaluate potential impacts to commercial and industrial properties and economic resources. When the planning level LOD impacts a structure or is within ten feet of a structure, that structure is considered a displacement (relocation) and the entire property is acquired. If the LOD intersects a property but does not bisect the property or is not within ten feet of a structure, it is considered a property impact but with partial acquisition and the structure remains (no displacement or relocation).

The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

3.2.3.2 Affected Environment

<u>Income</u>

Table 3-6 identifies the median household income for each block group within the study area, as well as Henry County, Martinsville, and Virginia to serve as a measure of comparison. The median household income of the study area census block groups ranges from $26,597 to $47,171. The average income of the study census block groups is $39,111, which is higher than the median household income of both Henry County ($34,992) and Martinsville ($31,719), but less than the statewide median household income ($66,149).

Table 3-6: Median Household Income

Location	Estimate
Census Tract 106.01 Block Group 1	$26,597
Census Tract 106.01 Block Group 2	$47,171
Census Tract 106.02 Block Group 1	$28,967
Census Tract 106.02 Block Group 2	$45,906
Census Tract 106.02 Block Group 3	$43,955
Census Tract 107 Block Group 2	$43,125
Census Tract 107 Block Group 3	$38,056
Average Study Area Income	**$39,111**
Henry County	$34,992
City of Martinsville	$31,719
Virginia	$66,149

Source: *U.S. Census Bureau, American Community Survey 2012-2016*.

Employment

According to ACS 5-Year Estimates (2012-2016), more residents were in the labor force (3,541) than not (2,860) in the study area census block groups (see **Table 3-7**), with an average median household income of $39,111. The number of residents in the labor force within the study area is 15 percent of all Henry County residents in the labor force (22,770). Based on a public survey VDOT conducted in October 2018, approximately 30 percent of the respondents said that they use Route 220 for business or commuting to and from work.

Table 3-7: Employed Population

Location	In Labor Force	Civilian Employed in Labor Force	Civilian Unemployed in Labor Force	Not in Labor Force
Census Tract 106.01 Block Group 1	504	482	22	581
Census Tract 106.01 Block Group 2	629	561	68	441
Census Tract 106.02 Block Group 1	438	419	19	290
Census Tract 106.02 Block Group 2	784	735	49	603
Census Tract 106.02 Block Group 3	695	686	9	494
Census Tract 107 Block Group 2	260	252	8	207
Census Tract 107 Block Group 3	231	202	29	244
Study Area Total	**3,541**	**3,337**	**204**	**2,860**
Henry County	22,770	20,623	2,147	20,098
Virginia	4,403,124	4,036,456	255,340	2,249,987

Source: *U.S. Census Bureau, American Community Survey 2012-2016*.

Business

Based on the number of employees, the top five business sectors within Henry County are manufacturing (4,015 employees), retail trade (2,127 employees), administrative support and waste management (1,267 employees), health care and social assistance (1,245 employees), and transportation and warehousing (1,179 employees). The top five largest employers in Henry County, in order, are the Henry County School Board, Eastman Chemical Co., formerly known as CPFilms, Inc., Monogram Management Services, GSI Solutions, and Results Customer Solution (VEC 2019). The Henry County School Board, the top employer, has two public schools within the study area: Drewry Mason Elementary School and Magna Vista High School (Henry County School Board). Additionally, along Route 220 within the study area, the corridor is lined with homes and businesses. Based on site observations, the main businesses are gas stations, hotels, fast food restaurants, and medical offices. Route 220 severs as the main access to and from these schools in the study area and businesses in Martinsville, highlighting the importance of

Route 220 for travel to employment for the population of Henry County and business destinations for local and regional travelers and commuters.

Additionally, the only current access to and from the Commonwealth Crossing Business Centre, located north of the Virginia-North Carolina State line and west of Route 220, is on Route 220 (see **Figure 3-6**). The current entrance to the Commonwealth Crossing Business Centre is located in North Carolina. Commonwealth Crossing is an advanced, pad-ready manufacturing industrial site (EDC 2019). Commonwealth Crossing is located in a Henry County Enterprise Zone (see **Figure 3-6**), which is an area designated to encourage investment through tax concessions and fewer government regulations and provide jobs for surrounding residents. In addition to Enterprise Zones, a large portion of the study area also is a designated Opportunity Zone (see **Figure 3-6**), which is an economically-distressed community where new investments may be eligible for preferential tax treatment (IRS 2019). According to the Virginia Department of Housing and Community Development (VDHCD), within the study area, Census Tracts 106.02 and 107 are identified as Designated Qualified Opportunity Zones in Virginia (VDHCD, 2019). Additionally, the Commonwealth Crossing Business Centre is also located the designated Opportunity Zone, specifically, in Census Tract 107, where investment in low-income census tracts is encouraged. Although there are currently no businesses situated within the business park, the site's first client, Press Glass, announced in early March 2019 their plan to invest $43.55 million to establish a factory (EDC 2019).

Press Glass is the largest flat glass processing operation in Europe and would create 212 new jobs for the area (EDC 2019). The business center would also house an on-site advanced manufacturing training facility for tenants, with workforce training provided by Patrick Henry Community College, one of the top ten employers in Henry County (sixth).

Other large industries/businesses within the Henry County Enterprise Zone within the study area, based on Henry County GIS and Google Maps™, are (see **Figure 3-6**):

- Radial, a warehouse located adjacent to Joseph Martin Highway and Memory Lane;
- DDI Logistics, a warehouse located north of Route 58 and east of Fisher Farm Road;
- Hopkins Lumber Contractor, located south of Route 58 and adjacent to Old Sand Road to the west;
- Warren Trucking and Virginia Glass Products Corporation, located north of Route 58 and east of Old Sand Road; and
- Martinsville Speedway, located north of Route 58.

3.2.3.3 Environmental Consequences

No-Build Alternative

The No-Build Alternative would have no direct impact on the economic environment, including on income or the distribution of business establishments. The No-Build Alternative would not change the current travel time for local and regional commuters. However, the heavy mix of local and regional truck traffic that exists today would continue and worsen in the No-Build condition.

Alternative A

Alternative A would not impact any commercial properties and could potentially result in three industrial property impacts, affecting two total acres of industrial land, but with no industrial relocations required. **Table 3-8** illustrates the number of industrial properties that would be impacted, the acreage of potential impacts, and the number of potential relocations associated with each alternative. Alternative A would not cause potential relocations or impacts to businesses. Any alternative requiring acquisition would require compensation in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act* of 1970 (as amended).

Figure 3-6: Enterprise Zones and Opportunity Zones Within the Study Area

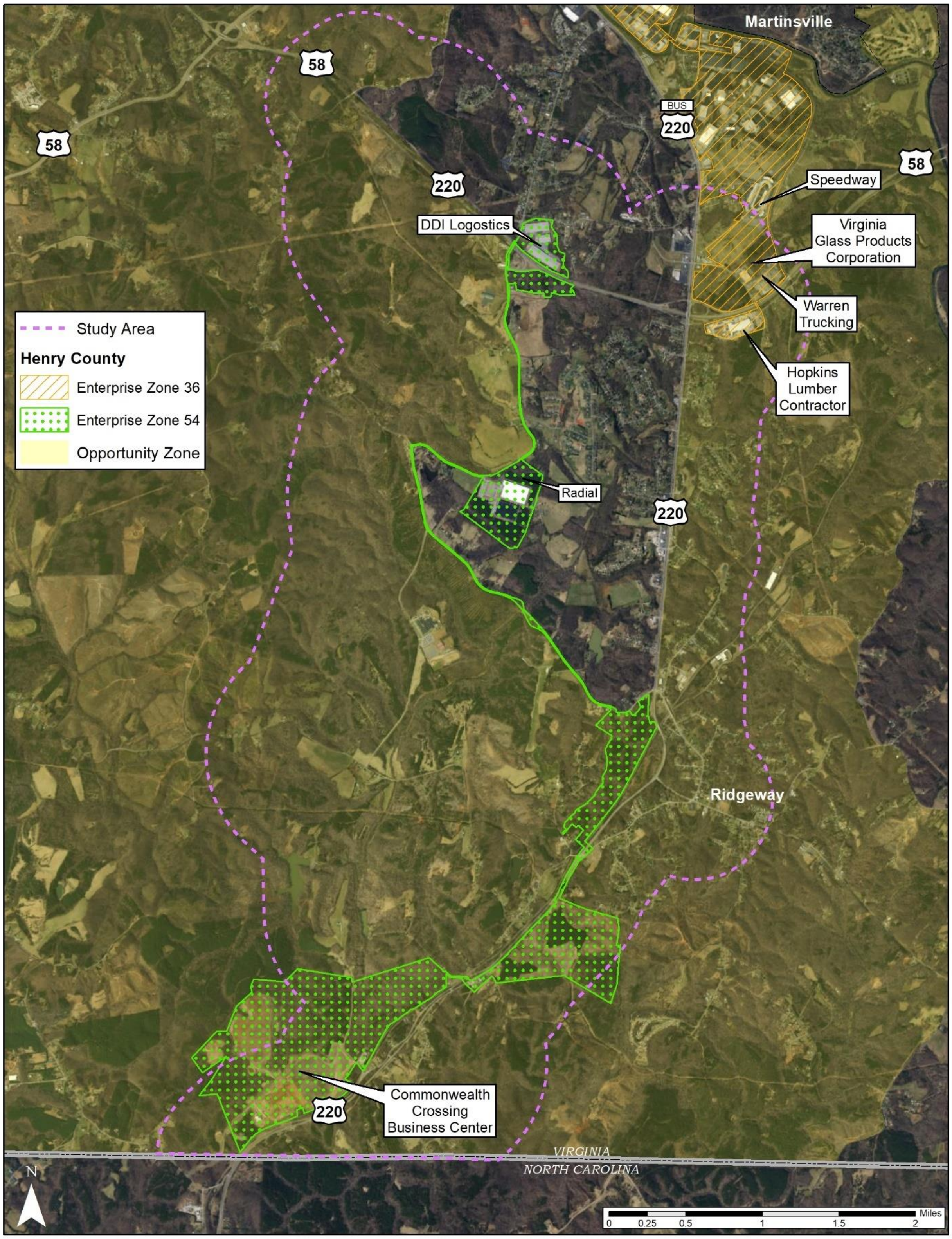


Table 3-8: Potential Industrial Impacts

Impact	Alternative A	Alternative B	Alternative C (Preferred Alternative)
# of Industrial Properties Impacted	3	6	6
Total Industrial Acres Impacted	2	48	48
Industrial Relocations	0	4	3

Note: Shaded column denotes Preferred Alternative.

Alternative A would not require any commercial or industrial relocations and would not have a direct effect on long-term employment, but construction could result in temporary jobs. Under Alternative A, commuter patterns would likely change for both local and regional traffic with the introduction of the new roadway. For local traffic from north of Church Street and Lee Ford Camp Road, commuting patterns would remain similar to today; however, the commuting time would improve due to the decrease in regional through traffic on Route 220. For local traffic with origins or destinations south of Church Street and Lee Ford Camp Road, commuting patterns would likely change by utilizing the new roadway for improved access to destinations or origins, north or west of the study area with improved access to Route 58/Route 220. For commuters located in the middle of the study area in Ridgeway, some may choose to use Soapstone Road to access the new roadway for destinations north and west of the study area.

For regional traffic that has commuting pattern origins or destinations south of the study area in North Carolina with destinations and origins north and west of the study area that currently utilize Route 58, under Alternative A, commuters would likely use the new roadway to benefit from the improved travel times and avoidance of the signalized and unsignalized intersections and driveways along Route 220. For commuting patterns north and east of the study area, commuters may choose to use Route 220 for a more local trip; however, for longer destination trips, commuters would likely use the new roadway to keep a continuous flow on the new roadway and minimize travel time delays on Route 220.

Alternative B

Alternative B would not impact any commercial properties, but could potentially result in six industrial property impacts, affecting 48 total acres of industrial land, resulting in three potential industrial relocations near the northern interchange with Route 58 and one potential industrial relocation to the east of Magna Vista School Road (see **Table 3-8**). The potential industrial relocations that would occur under Alternative B would impact the employees who work for the relocated industries. The industrial relocations could directly affect the employees' long-term employment depending on the location the business owner chooses to relocate to. The relocation could also affect the employees' commute patterns and travel times to the relocated businesses. The change in location to the industrial businesses would affect where industrial job opportunities are located. However, construction could result in temporary jobs.

Under Alternative B, commuter patterns would likely change for both local and regional traffic with the introduction of the new roadway. For local traffic from north of Church Street and Lee Ford Camp Road, commuting patterns would remain similar to today, however, the commuting time would improve due to the decrease in regional traffic on Route 220. For local traffic with origins or destinations south of Church Street and Lee Ford Camp Road, commuting patterns would likely change by utilizing the new roadway for improved access to destinations or origins, north or west of the study area with improved access to Route 58/Route 220. For commuters located in the middle of the study area in Ridgeway, some commuters may choose to use Soapstone Road to access the new roadway for destinations north and west of the study area.

For regional traffic that has commuting pattern origins or destinations south of the study area in North Carolina with destinations and origins north and west of the study area that currently utilize Route 58, under Alternative B, commuters would likely use the new roadway to benefit from the improved travel times and avoidance of the signalized and unsignalized intersections and driveways along Route 220. For commuting patterns north and east of the study area, commuters may choose to use Route 220 for a more local trip; however, for longer destination trips, commuters would likely use the new roadway to keep a continuous flow on the new roadway and minimize travel time delays on Route 220.

Alternative C (Preferred Alternative)

Alternative C would not impact any commercial properties but could result in six industrial property impacts, totaling 48 impacted acres and resulting in three potential industrial relocations near the northern interchange with Route 58 (see **Table 3-8**). The potential industrial relocations that would occur under Alternative C would impact the employees who work for the relocated industries. The industrial relocations could directly affect the employees' long-term employment depending on the location the business owner chooses to relocate to. The relocation could also affect the employees' commute pattern and travel time to the relocated businesses. The change in location to the industrial businesses would affect where industrial job opportunities are located. However, construction could result in temporary jobs.

Under Alternative C, commuter patterns would likely change for both local and regional traffic with the introduction of the new roadway. For local traffic from north of Church Street and Lee Ford Camp Road, commuting patterns would remain similar to today, however, the commuting time would improve due to the decrease in regional through traffic on Route 220. For local traffic with origins or destinations south of Church Street and Lee Ford Camp Road, commuting patterns would likely change by utilizing the new roadway for improved access to destinations or origins, north or west of the study area with improved access to Route 58/Route 220. For commuters located in the middle of the study area in Ridgeway, some commuters may choose to use Soapstone Road to access the new roadway for destinations north and west of the study area.

For regional traffic that has commuting pattern origins or destinations south of the study area in North Carolina with destinations and origins north and west of the study area that currently utilize Route 58, under Alternative C, commuters would likely use the new roadway to benefit from the improved travel times and avoidance of the signalized and unsignalized intersections and driveways along Route 220. For commuting patterns north and east the study area, commuters may choose to use Route 220 for a more local trip; however, for longer destination trips, commuters would likely use the new roadway to keep a continuous flow on the new roadway and minimize travel time delays on Route 220.

3.2.3.4 Mitigation

The potential impacts to commercial and industrial properties were evaluated at a planning level, the final property impacts would be dictated by the final design and placement of construction features. The potential acquisition from three properties under Alternative A and six properties under Alternatives B and C would receive reimbursement for the fair market value of property acquired in accordance with the *Uniform Relocation Assistance and Real Property Acquisition Policies Act* of 1970 (as amended). Additionally, the owners of the three industrial facilities that would be relocated under Alternative C and four industrial facilities that would be relocated under Alternative B would be provided relocation assistance advisory services and would be eligible to receive reimbursement for moving costs. Relocation resources would be provided without discrimination. Additionally, property owners would be able to consult VDOT's *A Guide for Property Owners and Tenants*, an information packet for property owners which provides information on VDOT's process of acquiring rights of way for public improvement projects.

3.2.4 Land Use

3.2.4.1 Regulatory Context and Methodology

Existing land use was mapped by extrapolating zoning information and reviewing against the use and class codes provided by County Tax Assessor data. Where there was conflicting information, visual interpretation of 2016 County aerial imagery was used to determine existing land use. Information on growth areas was gathered from the *Henry County Comprehensive Plan*. Specific growth areas were identified as areas having existing or planned road networks which can sustain traffic increases (HCPC 1995). Zoning information was used to interpret the land use designation, Zoned (Future) Land Use, by combining similar classifications (e.g., commercial future land use is a combination of General Commercial, Neighborhood Commercial, and Office/Professional zoning districts). Future land use was compared to existing land use to analyze the changes anticipated by the County within the study area and how the alternatives could affect those changes.

The study area used for resource identification is a half-mile buffer from the boundary of the combined planning level LODs for all of the Build Alternatives retained for evaluation. Each alternative planning level LOD was used to evaluate potential impacts to land use. The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

3.2.4.2 Affected Environment

Most development in the study area traditionally occurred either near Martinsville or within Ridgeway. Within the study area, concentrations of commercial activity can be found south of the Martinsville city limits, immediately north and south of the intersection of Route 220 and Route 58, at the intersection of Route 220 and Route 902, and along Main Street in Ridgeway. The *Henry County Comprehensive Plan* indicated that the increase of commercial growth within this segment of the Route 220 corridor was a result of the full access control on Route 58 around Martinsville, which opened the area to more traffic (HCPC, 1995). Further south, strip commercial development also occurred, north of Ridgeway.

Of the 12,870 acres within the study area, the land use with the highest percentage is undeveloped/covered by water, with 46 percent (5,876 acres) (see **Table 3-9**). However, it is possible that portions of the land identified as undeveloped may have utility infrastructure present and may be available for near-term development. The next greatest use is residential, with 22 percent (2,848 acres), primarily due to a majority of the residential properties being located on large areas of land. The remaining land uses in order of percentage are agricultural with 17 percent (2,171 acres), right of way with six percent (730 acres), industrial with five percent (705 acres), institutional or public use with three percent (367 acres) and commercial with one percent (173 acres). See **Figure 3-7** for mapping of these land use extents.

Table 3-9: Existing Land Use within the Study Area

Land Use	Acres within Study Area	Percent of Study Area Covered
Undeveloped/Water	5,876	46
Residential	2,848	22
Agricultural	2,171	17
ROW	730	6
Industrial	705	5
Institutional/Public Use	367	3
Commercial	173	1
Study Area Total	**12,870**	**100**

Note: *Acreages and percentages are rounded.*
Source: *Land Use Data was interpreted from Henry County Zoning and Assessor Data, and Aerial Images as described in the Methods section.*

The future land use within the study area is primarily zoned as agricultural (64 percent), 16 percent is planned for residential land use, and the remaining 20 percent is zoned as industrial (9 percent), right of way (6 percent), institutional/public use (2 percent), commercial (2 percent), mixed land use (0.5 percent), and unknown zoning (0.5 percent). Additionally, the *Henry County Comprehensive Plan* identified a designated growth area in the southern section of the study area, the Ridgeway Growth Area (HCPC, 1995). The majority of the study area is located within the Ridgeway Growth Area, approximately 8,535 acres or 66 percent. **Figure 3-8** illustrates the extents of the zoned (future) land use and the Ridgeway Growth Area. More detailed information on the zoned (future) land use is included in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c).

3.2.4.3 Environmental Consequences

No-Build Alternative

The No-Build Alternative would not result in any project-related construction and would therefore not directly require any right of way acquisitions. The No-Build Alternative would have no direct impacts on land use and would not affect any parcels within the study area. The future land use and development consistent with the Comprehensive Plan would continue regardless of the conditions of the roadway network. However, the heavy mix of local and regional truck traffic that exists today would continue and worsen in the No-Build condition.

Figure 3-7: Existing Land Use

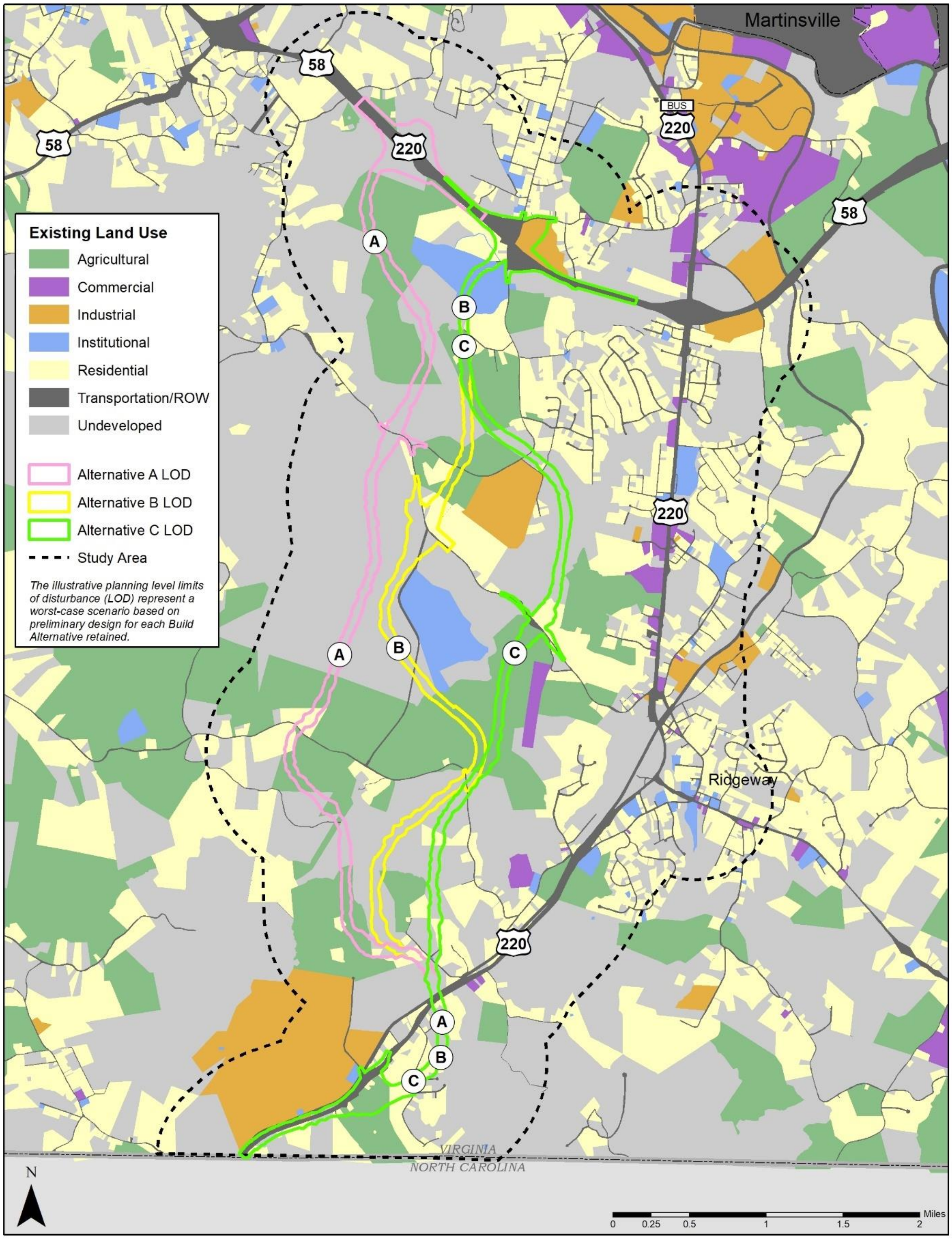
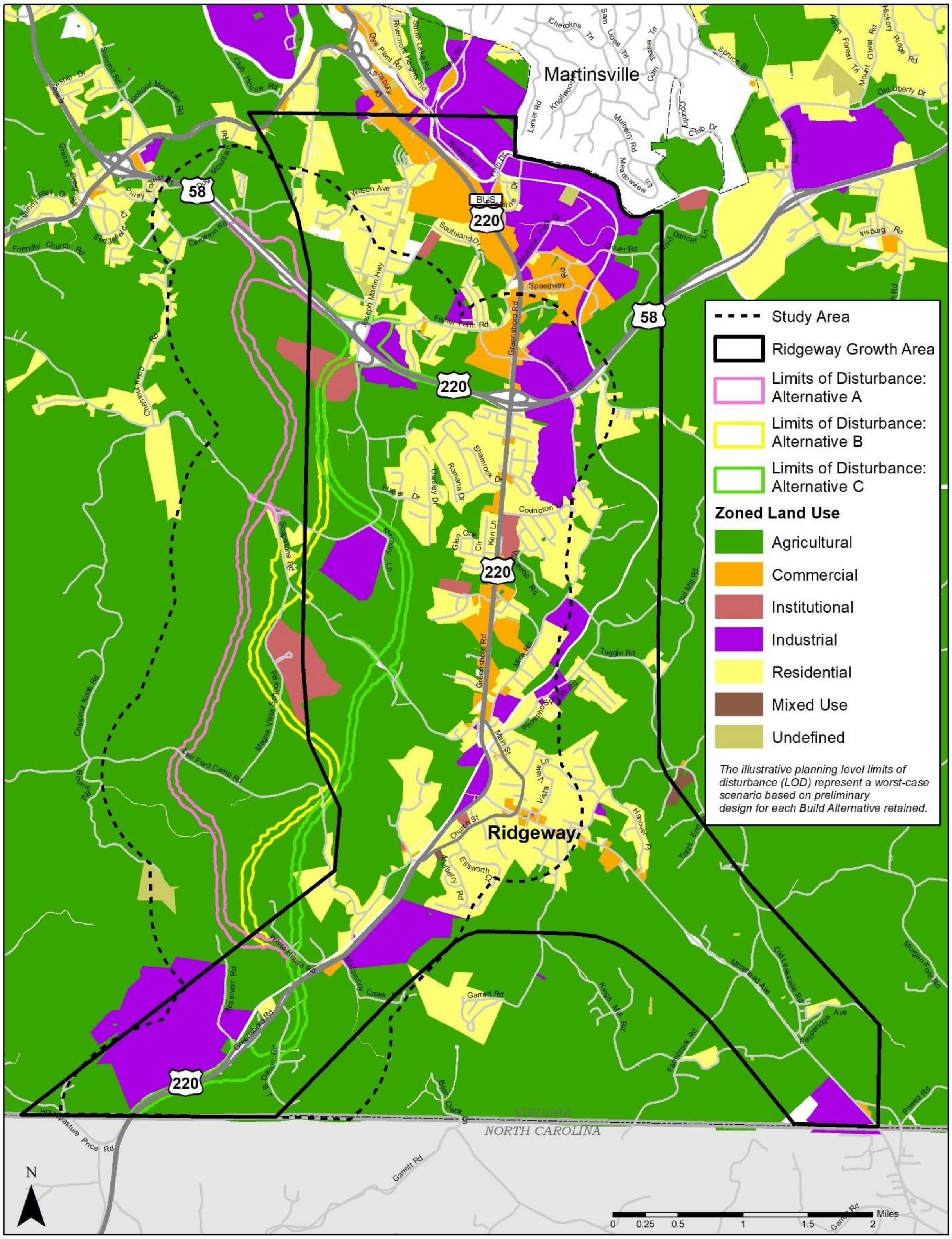


Figure 3-8: Zoned (Future) Land Use



Alternative A

Alternative A would require the conversion of an estimated 574 acres of land from 162 parcels for conversion to transportation land use. The acquisition would consist of an estimated 279 acres of undeveloped land (49 percent), an estimated 64 acres of residential land (11 percent), an estimated 144 acres of agricultural land (25 percent), an estimated 84 acres of right of way/ transportation (15 percent), an estimated two acres of industrial land, and an estimated one acre of institutional/public land (see **Table 3-10**). The agricultural land that would be converted to transportation land use within the planning level LOD of Alternative A is located immediately south of Route 58. The undeveloped land that would be converted to transportation land use is located in the northern half of the planning level LOD of Alternative A. The conversion of land use would occur where new roadway would be constructed including potential interchange locations, as well as for improvements to expand existing roadways. The land conversion to transportation use was calculated based on a worst-case planning level LOD. The final impacts to land uses would be determined as the final design and engineering is further developed. The conversion of 574 acres to transportation use would be a relatively small percent (4.4) when compared to the 12,870 acres within the study area.

Table 3-10: Potential Impacts to Land Use (by acreage of parcel)

Land Use Impact	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Undeveloped/ Water	279	239	176
Residential	64	82	85
Agricultural	144	100	115
ROW/Transportation	84	101	102
Industrial	2	48	48
Institutional/ Public Use	1	14	15
Commercial	0	0	0
Total	**574**	**584**	**541**

Note: Shaded column denotes Preferred Alternative.

The majority of the planning level LOD of Alternative A where the existing land uses would be converted to transportation use and the adjacent areas are zoned for future agricultural land use. The new alignment portion of the planning level LOD generally parallels the Ridgeway Growth Area, which is identified in the *Henry County Comprehensive Plan* as areas having existing or planned road networks which can sustain traffic increases. The majority of the planning level LOD for Alternative A (69 percent) is located west of the Ridgeway Growth Area, 31 percent of the planning level LOD for Alternative A is within the Ridgeway Growth Area (154 acres) (HCPC, 1995). While the construction of Alternative A would not disrupt future plans for growth in the area, it could extend potential future growth outside of the designated growth area.

Although the *Henry County Comprehensive Plan* does not identify the Martinsville Southern Connector as a future project, the alternatives evaluated in the Draft EIS, including Alternative A, are present on the Henry County GIS mapping service (Henry County, 2019).

Alternative B

Alternative B would require the acquisition of an estimated 584 acres from 240 parcels for conversion to transportation land use. The acquisition would consist of an estimated 239 acres of undeveloped land (41 percent), an estimated 82 acres of residential land (14 percent), an estimated 100 acres of agricultural land (17 percent), an estimated 101 acres of right of way/ transportation (17 percent), an estimated 48 acres of industrial land (8 percent), and an estimated 14 acres of institutional land (2 percent) (see **Table 3-10**). The potential industrial land that would be converted to transportation land use within the planning level LOD of Alternative B is located north of Route 58 and the agricultural and undeveloped lands that would be converted to transportation land use are located in the central portion of the planning level LOD of Alternative B. Right of way and transportation land use accounts for an estimated 101 acres within the planning level LOD of Alternative B (17 percent). The conversion of 548 acres to transportation use would be a relatively small percent (4.5) when compared to the 12,870 acres within the study area.

The majority of the planning level LOD for Alternative B where the existing land uses would be converted to transportation use and the adjacent areas are zoned for future agricultural land use. However, small portions of the planning level LOD of Alternative B and adjacent areas are zoned for residential use, industrial use, and institutional/public use. Generally, residential and institutional land uses are not compatible with transportation uses. The new alignment would generally not be compatible with institutional and residential uses due to associated potential increases in noise and potential for community fragmentation. The new alignment portion of the planning level LOD is partially located west of the Ridgeway Growth Area and partially within the western edge of the area, 67 percent of the planning level LOD for Alternative B is within the Ridgeway Growth Area (321 acres), which is identified in the *Henry County Comprehensive Plan* as areas having existing or planned road networks which can sustain traffic increases (HCPC, 1995). While the construction of Alternative B would not disrupt future plans for growth in the area, it could extend potential future growth outside of the designated growth area south of Soapstone Road.

Although the *Henry County Comprehensive Plan* does not identify the Martinsville Southern Connector as a future project, the alternatives evaluated in the Draft EIS, including Alternative B, are present on the Henry County GIS mapping service (Henry County, 2019).

Alternative C

Alternative C would require the acquisition of an estimated 541 acres from 248 parcels for conversion to transportation land use. The acquisition would consist of an estimated 176 acres of undeveloped land (33 percent), an estimated 85 acres of residential land (16 percent), an estimated 115 acres of agricultural land (21 percent), an estimated 102 acres of right of way/ transportation (19 percent), an estimated 48 acres of industrial land (nine percent), and an estimated 15 acres of institutional land (three percent) (see **Table 3-10**). The industrial land that would be converted to transportation land use within the planning level LOD of Alternative C is located north of Route 58 and the agricultural and undeveloped lands that would be converted to transportation land use are located in the central portion of the planning level LOD of Alternative C. The conversion of 541 acres to transportation use would be a relatively small percent (4.2) when compared to the 12,870 acres within the study area.

The majority of the planning level LOD for Alternative C where the existing land uses would be converted to transportation use and the adjacent areas are zoned for future agricultural land use. However, small portions of the planning level LOD for Alternative C and adjacent areas are zoned for industrial and institutional/public use. Generally, institutional land use is not compatible with transportation uses. The new alignment would generally not be compatible with institutional uses due to associated potential increases in noise and potential for fragmentation.

The new alignment portion of the planning level LOD is generally located within the western portion of the Ridgeway Growth Area, 92 percent of the planning level LOD for Alternative C is within the Ridgeway Growth Area (412 acres), which is identified in the *Henry County Comprehensive Plan* as areas having existing or planned road networks which can sustain traffic increases (HCPC, 1995). The construction of Alternative C would not disrupt future plans for growth in the area and could encourage the growth to stay within the designated growth area.

Although the *Henry County Comprehensive Plan* does not identify the Martinsville Southern Connector as a future project, the alternatives evaluated in the Draft EIS, including Alternative C, are present on the Henry County GIS mapping service (Henry County, 2019).

3.2.4.4 Mitigation

Impacts to land use are anticipated to be minor. Additionally, the conversion to transportation use would be relatively small when compared to the existing total acreage per land use class in the study area. The anticipated minor impacts to land use were determined at a planning level, and final land use impacts would be determined during future design.

Coordination occurred between VDOT, Henry County, and the West Piedmont Planning District Commission (WPPDC) during the development of this Draft EIS to determine consistency with land use; however, the responsibility for land use planning lies with the local jurisdictions, such that jurisdictions manage zoning changes to accommodate local and regional goals and future zoning plans. Although the localities anticipate the future land use changes identified during the development of this Draft EIS, additional coordination with local jurisdictions that manage zoning changes to mitigate extensive impacts to land use would be continued and addressed during final design. Mitigation measures to land use would be coordinated with localities, as necessary.

3.3 ENVIRONMENTAL JUSTICE

3.3.1 Regulatory Context and Methodology

Title VI of the Civil Rights Act of 1964 (Public Law 88-352 78 Statute 241), as amended, requires no person in the United States shall, on the ground of race, color, or national origin (including individuals with Limited English Proficiency), be excluded from participating in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance. The FHWA Technical Advisory T6640.8A, *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*, implements Title VI in assessing environmental effects.

The FHWA Title VI Program is broader than the Title VI statute and encompasses other nondiscrimination statutes and authorities, including Executive Order (EO) 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994). Additional nondiscrimination statutes and authorities are explained in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c).

EO 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994) requires, among other things, identification of minority and low-income populations to ensure that Federal programs do not result in disproportionately high and adverse environmental or health impacts to minority populations or low-income populations. A disproportionately high and adverse effect on minority and low-income population locations occurs, as defined by the FHWA Environmental Justice Order, when the impact:

- Would be predominately borne by a minority and/or low-income population, or
- Would be suffered by the minority population and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that would be suffered by the non-minority population and/or non-low-income population.

The strategies developed under EO 12898 and the United States Department of Transportation (USDOT)/FHWA policies on Environmental Justice (EJ) take the appropriate and necessary steps to identify and address disproportionately high and adverse effects of Federal transportation projects on the health or environment of minority and low-income populations to the greatest extent practicable and permitted by law, while ensuring EJ communities are proactively provided meaningful opportunities for public participation in project development and decision-making.

The terms minority and low-income, utilized in this study, have been defined in the USDOT Order 5610.2(a), *USDOT Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (2012) and FHWA Order 6640.23A, *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (2012) as below:

- Minority Individual – the USDOT and FHWA EJ Orders define a minority individual as belonging to one of the following groups:
    - (1) Black: a person having origins in any of the black racial groups of Africa;
    - (2) Hispanic or Latino: a person of Mexican, Puerto Rican, Cuban, Central or South American, or other Spanish culture or origin, regardless of race;
    - (3) Asian American: a person having origins in any of the original peoples of the Far East, Southeast Asia, or the Indian subcontinent;
    - (4) American Indian and Alaskan Native: a person having origins in any of the original people of North America, South America (including Central America), and who maintains a cultural identification through Tribal affiliation or community recognition; or
    - (5) Native Hawaiian and Other Pacific Islander: a person having origins in any of the original peoples of Hawaii, Guam, Samoa, or other Pacific Islands.
- Low-Income Individual – the FHWA and USDOT Orders define a low-income individual as a person whose median household income is at or below the Department of Health and Human Services (HHS) poverty guidelines.

EO 12898, USDOT Order 5610.2(a), *USDOT Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (2012), and FHWA Order 6640.23A *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (2012) are aimed at identifying minority and low-income populations and addressing any disproportionately high and adverse effects from Federal actions to minority and low-income populations. VDOT, working with FHWA and the EPA, developed a methodology for identifying EJ populations for transportation studies in Virginia. The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information). Using these approved methods, the following definitions apply to this study:

- Minority Populations – Any readily identifiable groups of minority persons who live in geographic proximity, and if circumstances warrant, geographically dispersed/transient persons (such as migrant workers or Native Americans) who would be similarly affected by a USDOT/FHWA program, policy or activity (USDOT and FHWA EJ Orders).

A minority population was determined to be present when: (a) the minority population of the affected area exceeded 50 percent of the total population, or (b) the minority population percentage in the affected area was meaningfully greater than the minority population percentage in the general population or other appropriate unit of geographical analysis (CEQ 1997).

For the purposes of this study, the unit of geographic analysis utilized was the block group, with boundaries defined by the U.S. Census Bureau, and the surrounding geographic areas in the study area is defined as the Henry County boundary. The average minority population percentage of Henry County is used to determine the threshold for meaningfully greater minority population percentages within block groups in the study area. Using this data from Henry County, the minority population for each census block group is meaningfully greater than the surrounding geographic areas in the study area if its minority population exceeds 31.78 percent.

- Low-Income Population – Any readily identifiable group of low-income persons who live in geographic proximity, and, if circumstances warrant, geographically dispersed/transient persons (such as migrant works or Native Americans) who would be similarly affected by a proposed USDOT/FHWA program, policy, or activity (USDOT/FHWA EJ Orders).

Data from the 2012-2016 ACS 5-Year Estimates, Median Household Income in the past 12 months (in 2016 inflation-adjusted dollars) were used to generate median household income data for each of the Census block groups within the study area. These data were compared to the HHS 2018 poverty level for the average household size (HHS 2019). The HHS poverty guidelines (HHS 2019) were used for the study as they are most appropriate for comparing the latest available median household income to the most recent 5-Year ACS data.

Considering the diverse demographic composition of the study area, a variety of outreach techniques and materials were used to inform citizens and other interested parties about the details of the study and to solicit their comments and concerns, including a study website, monthly study newsletters, online surveys, social media advertisements, citizen information meetings and public hearings. Additionally, in accordance with EO 13166 – *Improving Access to Services for Persons with Limited English Proficiency*, VDOT made public involvement materials available in the Spanish language. Translation assistance was made available for public outreach materials and presentations and associated materials from various meetings were made available in Spanish to provide opportunities for limited English proficiency persons to provide input and feedback during the study public involvement process. Additional information on outreach to EJ communities is included in the ***Socioeconomic and Land Use Technical Report*** (VDOT, 2020c).

3.3.2 Affected Environment

3.3.2.1 Minority Populations

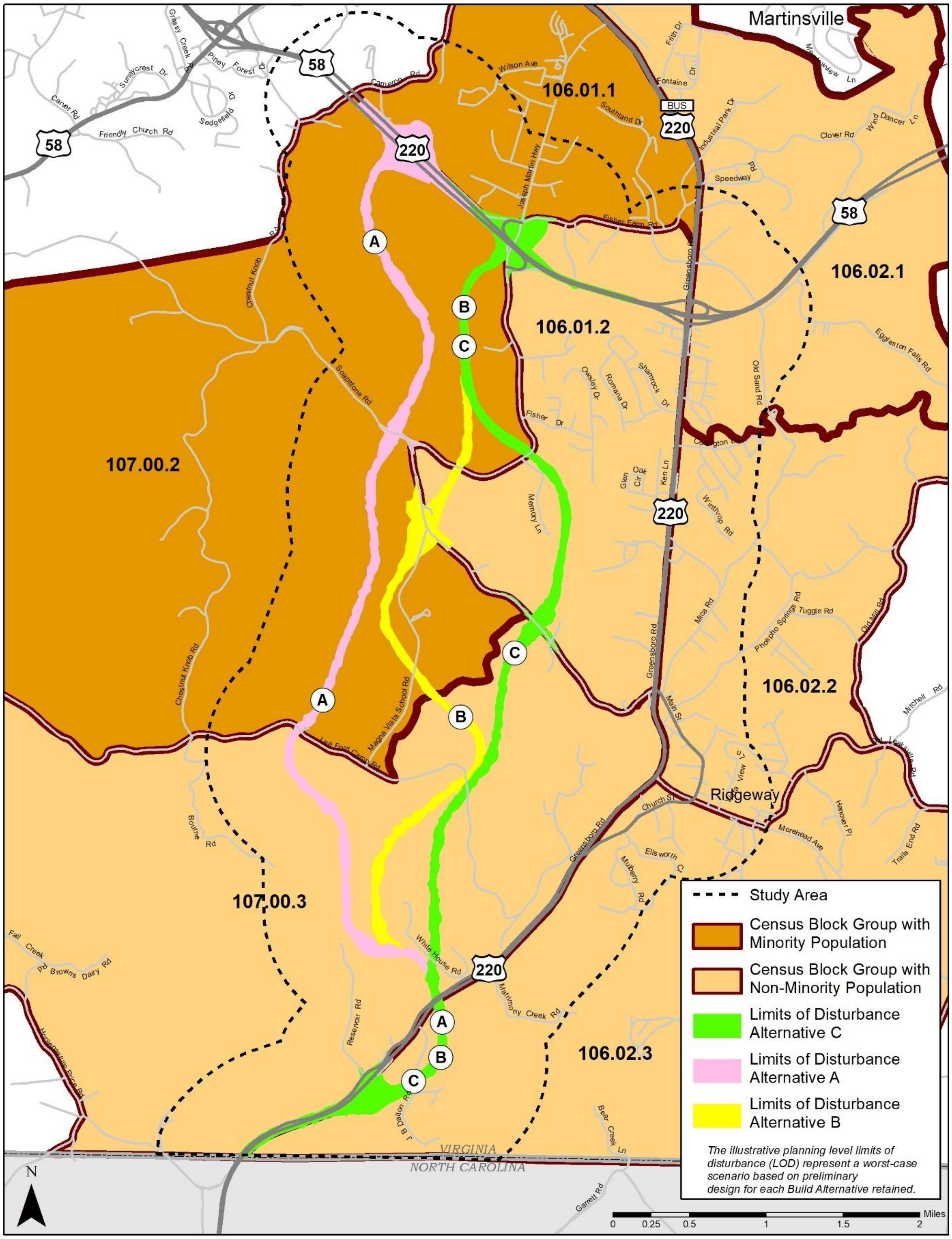
Table 3-11 provides a summary of racial and minority characteristics by census block group. All census block groups that were determined to be EJ communities based upon having meaningfully greater minority population percentages are shown on **Figure 3-9** and are in shown in **Table 3-11**. County and state percentages are also depicted for comparison.

Table 3-11: Study Area Racial and Ethnic Characteristics

Census Tract	Census Block Group	Total Population	Total Block Group Minority Population[1]	
		No.	No.	%
Census Tract 106.01	**Block Group 1**	1,515	**635**	**42.00**
Census Tract 106.01	Block Group 2	1,287	179	13.91
Census Tract 106.02	Block Group 1	1,030	236	22.91
Census Tract 106.02	Block Group 2	1,592	346	21.73
Census Tract 106.02	Block Group 3	1,403	264	18.82
Census Tract 107	**Block Group 2**	612	**269**	**43.95**
Census Tract 107	Block Group 3	550	128	23.27
Henry County		54,151	17,209	31.78
Virginia		8,001,024	3,145,997	39.32

Source: U.S. Census Bureau, 2010 Decennial Census
[1] *Total minority population is the sum of all non-White races plus Hispanic or Latino – White; block groups with percentages of minority and/or Hispanic/Latino greater than the 31.78 percent threshold are bolded.*

Figure 3-9: Minority Population Census Block Groups in the Study Area



Of the seven census block groups within the study area, two block groups, Census Tract 106.01 Block Group 1 and Census Tract 107 Block Group 2, are identified as having meaningfully greater minority population percentages. Both block groups within the study area are located to the northwest of Ridgeway. Of the percentage of minority populations in both block groups, the highest percent of the minority population is Black or African American individuals (approximately 18 percent and 42 percent, respectively).

Additionally, Census Tract 106.01 Block Group 1 has a relatively high percent of Hispanic or Latino populations (11 percent) compared to Henry County (5 percent). In accordance with EO 13166 – *Improving Access to Services for Persons with Limited English Proficiency*, VDOT made public involvement materials available in Spanish language. Presentations from the January 23, 2019 CIM and the August 15, 2019 Location Public Hearing were published with Spanish language captioning available. The information brochure for the August 2019 Location Public Hearing was fully translated to Spanish and made available on the study website. See **Section 6.3** for more information on public involvement.

The two block groups (Census Tract 106.01 Block Group 1 and Census Tract 107 Block Group 2) that have been identified as having meaningfully greater minority population percentages are referred to as the minority block groups. At this stage, there is no specific information on whether there is a minority property owner for any of the potential relocations. Alignment Options 5A-D (east of Route 220) were evaluated early in the study which would have avoided impacts to these two blocks groups, however they were not retained for evaluation because they did not meet the Purpose and Need.

3.3.2.2 Low Income

According to the ACS 2016 data, the average household size of Henry County is 2.33 family members. A family of three was used as the poverty threshold to be conservative for identifying census block groups with a low median household income within the study area. The 2018 HHS Poverty Guidelines of the 48 Contiguous States and the District of Columbia identifies the poverty threshold as $20,780 for a family of three (HHS 2019).

Table 3-6 in **Section 3.2.3.2** identifies the median household income for each block group within the study area, as well as Henry County, Martinsville, and Virginia, to serve as a measure of comparison. No census block groups within the study area have a median household income below the 2018 HHS poverty threshold of $20,780 for a family of three. Therefore, no low-income populations have been identified within the study area.

While the census data does not identify any low-income block groups, all of the elementary schools with Henry County are identified as Title I schools, which qualifies them for receiving Federal financial assistance administered through the U.S. Department of Education's Elementary and Secondary Education Act. The Title I program is intended to ensure that all children have a fair, equal, and sufficient opportunity to obtain a high-quality education and reach, at a minimum, proficiency on challenging State academic achievement standards and state academic assessments, according to the U.S. Department of Education. To be eligible to use Title I funds to upgrade the entire educational program in a Title I school, the school must serve a population where at least 40 percent of their students are considered low-income.

3.3.3 Environmental Consequences

3.3.3.1 Minority Populations

<u>No-Build Alternative</u>

The No-Build Alternative would not impact any residences within the minority block groups. Additionally, the impacts resulting from the lack of improvements would be felt by all residents, including minority and low-income populations, and thus would not result in a disproportionate and adverse impact to EJ populations. However, the heavy mix of local and regional truck traffic that exists today would continue and worsen in the No-Build condition.

Alternative A

Over two-thirds of the planning level LOD of Alternative A is located within the two minority block groups. Additionally, two of the potential interchanges, Route 58 and Soapstone Road, are within the two minority block groups. However, a majority of the land within the minority block groups is agricultural with few residential properties and homes. Of the 17 potential residential relocations that would occur with Alternative A; three would occur within the minority block groups.

Due to the new facility being access controlled, the impact to the surrounding area would be confined to the footprint of the alignment and associated interchanges as regional traffic, including trucks, would not be able to access the facility at all roadway crossings. Local access to neighborhoods would be maintained due to grade separation of the new roadway from the existing roadways, except for Soapstone Road where an interchange would be provided.

The decrease in mainline traffic volumes would reduce the intersection travel delay times and queue lengths, improving local connectivity and access to Route 220 from side streets and businesses. The improved local connectivity and access between communities, community facilities, and for emergency vehicles would include the Census block groups containing EJ populations. Therefore, Alternative A would not result in disproportionate and adverse impacts to EJ populations because any beneficial effects would equally affect the Census block groups containing and not containing EJ populations and the impacts to minority block groups would not be greater in magnitude than impacts to non-minority block groups.

Alternative B

The northern portion of the planning level LOD of Alternative B and the potential interchange with Soapstone Road would be located within the two minority block groups. Of the 26 potential residential relocations that would occur with Alternative B; nine would occur within the minority block groups.

Due to the new facility being access controlled, the impact to the surrounding area would be confined to the footprint of the alignment and associated interchanges as regional traffic, including trucks, would not be able to access the facility at all roadway crossings. Local access to neighborhoods would be maintained due to grade separation of the new roadway from the existing roadways, except for Soapstone Road where an interchange would be provided.

The decrease in mainline traffic volumes would reduce the intersection travel delay times and queue lengths, improving local connectivity and access to Route 220 from side streets and businesses. The improved local connectivity and access between communities, community facilities, and for emergency vehicles would include the Census block groups containing EJ populations. Therefore, Alternative B would not result in disproportionate and adverse impacts to EJ populations because any beneficial effects would equally affect the Census block groups containing and not containing EJ populations and the impacts to minority block groups would not be greater in magnitude than impacts to non-minority block groups.

Alternative C (Preferred Alternative)

The northern portion of the planning level LOD of Alternative C is located within the two minority block groups. Of the 25 potential residential relocations that would occur with Alternative C, nine would occur in within the minority block groups. The interchange of Alternative C with Soapstone Road would be located outside of the minority block groups, minimizing potential impacts to minority populations and minimizing impacts associated with subsequent growth and development surrounding a new interchange.

Due to the new facility being access controlled, the impact to the surrounding area would be confined to the footprint of the alignment and associated interchanges as regional traffic, including trucks, would not be able to access the facility at all roadway crossings. Local access to neighborhoods would be maintained due to grade separation of the new roadway from the existing roadways, except for Soapstone Road where an interchange would be provided.

The decrease in mainline traffic volumes would reduce the intersection travel delay times and queue lengths, improving local connectivity and access to Route 220 from side streets and businesses. The improved local connectivity and access between communities, community facilities, and for emergency vehicles would include the Census block groups containing EJ populations. Therefore, Alternative C would not result in disproportionate and adverse impacts to EJ populations because any beneficial effects would equally affect the Census block groups containing and not containing EJ populations and the impacts to minority block groups would not be greater in magnitude than impacts to non-minority block groups.

3.3.3.2 Low-Income Populations

There are no Census block groups within the study area that have a median household income below the 2018 HHS Poverty threshold of $20,780 for a family of three; therefore, no further assessment of impacts to a low-income population is required.

3.3.3.3 Summary of Findings

Based on traffic analyses, it was determined that any alternative that would accommodate regional traffic would need to facilitate the primary regional through traffic movements to the south and west of the study area; therefore, the eastern alignment options investigated previously were not retained for detailed evaluation (see **Section 2.3**). Further, based on the distance required between interchanges, any interchange would need to be located west of the existing interchange of Route 58 and Route 220 to accommodate all movements. A more detailed discussion is available in the ***Alternatives Analysis Technical Report*** (VDOT 2019b). Therefore, due to the portion of the study area with the identified minority block groups, any alternative able to meet the purpose and need of the study would require intersection with the identified minority block groups, and therefore, potentially require relocations.

In accordance with EO 12898 *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (1994) and FHWA Order 6640.23A *FHWA Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (2012), no alternatives would result in disproportionate and adverse impacts to EJ populations because any effects would equally affect the Census block groups containing and not containing EJ populations and the impacts to minority block groups would not be greater in magnitude than impacts to non-minority block groups.

3.3.3.4 Mitigation

VDOT right of way staff would coordinate with residents requiring relocation. The potential impacts were evaluated at a planning level, the final property impacts would be dictated by the final design and placement of construction features. Relocation resources would be made available without discrimination. VDOT's relocation policies provide an added benefit to low-income displaced persons (although no Census blocks were identified with a median household income lower than the poverty guidelines, individual property owners may qualify as low-income displaced persons). The relocation program outlines special cases where a displaced person is eligible for a price differential payment in addition to the fair market value of the property to help defray the costs necessary to purchase a comparable, decent, safe, and sanitary replacement dwelling. If appropriate housing cannot be found, VDOT can provide housing of last resort. Housing of last resort may include relocation in a rehabilitated dwelling, construction of an addition to a relocation dwelling, purchase of land and construction of a new replacement dwelling, a replacement housing payment in excess of the price differential, or a direct loan that would enable the displaced person to construct or contract the construction of a replacement dwelling. Additionally, public outreach and meaningful access to public information would continue to be provided to minority and/or low-income populations. Property owners would be able to consult VDOT's *A Guide for Property Owners and Tenants*, an information packet for property owners which provides information on VDOT's process of acquiring rights of way for public improvement projects.

3.4 HISTORIC RESOURCES

3.4.1 Regulatory Context and Methodology

Section 106 of the National Historic Preservation Act (NHPA) of 1966 (as amended) (54 U.S.C. §306108) and its implementing regulations (36 CFR §800) require Federal agencies to take into account the effects of their undertakings on historic properties, which are defined as buildings, structures, sites, districts and objects, generally at least 50 years of age, that are listed on or eligible for listing on the National Register of Historic Places (NRHP). The Section 106 process is undertaken by Federal agencies in consultation with the State Historic Preservation Officer (SHPO), which in Virginia is the director of the VDHR; the Advisory Council on Historic Preservation (ACHP), as appropriate; Federally-recognized Indian tribes; representatives of local government; and other parties with a demonstrated interest in an undertaking. For the purpose of this study, the Martinsville-Henry County Historical Society confirmed its interest in participating in Section 106 consultation. Additional parties invited to participate in Section 106 consultation on the Martinsville Southern Connector Study are listed in **Section 6.2.6**.

3.4.1.1 Architectural Resources

The cultural resources studies undertaken to date support the Section 106 process for the Martinsville Southern Connector Study detail the results of VDOT's efforts thus far to identify the archaeological and non-archaeological, or architectural resources that might be affected by Alternatives A, B, and C, and to assess the significance of these resources against the eligibility criteria of the NRHP (36 CFR §60.4).

Prior to undertaking these studies, an Area of Potential Effects (APE) was defined for each Build Alternative. The APE is the geographic area within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, and its size and shape is influenced by the scale and nature of an undertaking. The APE for non-archaeological or architectural resources varies according to modern development, size of land parcel, and topography. The APE for archaeological and architectural resources were expanded at locations of potential interchanges or interchange improvements. In April 2019, VDOT coordinated the VDHR to reach agreement on the direct and indirect APE for the Martinsville Southern Connector Study, prior to initiating any research or reconnaissance surveys for cultural resources. The SHPO provided concurrence with the APE and eligibility determination for the architectural resources in October 2019 (see **Section 3.4.2.1**).

3.4.1.2 Archaeological Resources

The direct effects APE for archaeological resources for the Martinsville Southern Connector Study consists of the Alternative Inventory Corridor for each Build Alternative. For the purpose of determining where archaeological survey still needs to be conducted in order to ensure that all archaeological sites eligible for listing on the NRHP and potentially affected by the Martinsville Southern Connector Study are taken into account, an archaeological assessment (Phase IA) was prepared. Preparation of the archaeological assessment report involved the compilation of all relevant background information to inform the development of this Draft EIS and decision making regarding the management needs of below ground historic resources. Additional information can be found in the ***Phase I A Archaeological Assessment*** (VDOT, 2020h). The report reviews the geographic coverage and findings of previous archaeological survey undertaken by VDOT and others in relation to the Martinsville Southern Connector direct effects APE and describes present land use conditions in order assess the land's potential to contain intact archaeological remains. Section 6 of the Phase IA assessment report identifies several areas of the direct effects APE where additional archaeological survey is warranted. These recommendations for archaeological survey have been coordinated with the SHPO and were concurred upon in October 2019 (see **Appendix C**).

3.4.2 Affected Environment

3.4.2.1 Architectural Resources

Belleview (VDHR No. 044-0002), is at the intersection of Soapstone Road and Route 641 (Joseph Martin Highway), approximately 1.21 miles west of Route 220 in Henry County. Belleview is a late-18th century house with Federal details. The historic property was listed on the NRHP in 1974 under Criterion C for its significance in architecture. The Virginia Cultural Resource Information System (V-CRIS) record for this property states that the dwelling burned in the early 1990s; however, during the course of the fieldwork for this study it was discovered that the dwelling has been carefully restored and therefore, still retains sufficient integrity to convey its significance.

Marrowbone (VDHR No. 044-0009), located just east of the intersection of Route 1060 (Magna Vista School Road) and Route 688 (Lee Ford Camp Road), Marrowbone is approximately 1.23 miles west of Route 220 in Henry County. Marrowbone is a ca. 1870 Italianate house, a very uncommon style for Henry County. The property was determined eligible for the NRHP in 1996 under Criterion C for its significance in architecture.

Patterson Cemetery (VDHR No. 044-5182), sits between Route 220 and the Norfolk and Southern railroad tracks. The Patterson Cemetery contains approximately 40 burials from the late-18th century into the mid-20th century. The gravestones have varying degrees of decoration from simple unmarked stones, to more elaborate decorative markers. The Patterson Cemetery was determined eligible in 2009 under Criterion D for the resource's potential to yield information.

Price Cemetery (VDHR No. 044-5183), is just northwest of Route 220. The Price Cemetery contains approximately 25 burials that date from the mid- to late-19th century to the mid-20th century. The cemetery contains larger stones engraved with the name Price, and simple, unmarked fieldstones. The Price Cemetery was determined eligible for the NRHP in 2009 under Criterion D due to its information potential.

Watkins Cemetery (VDHR No. 044-5188), is located approximately 0.74 miles northwest of Route 220. The cemetery contains approximately 44 burials, including 33 burials from the Payne Cemetery. The individuals from the Payne Cemetery were interred into the Watkins Cemetery in 2009. The Watkins Cemetery was determined eligible for the NRHP in 2009, under Criterion D for its information potential. Only two of the original interments in the Watkins Cemetery contain gravestones.

The results of field surveys and archival research undertaken for the purposes of identifying architectural historic properties within the direct and indirect effects APEs for the three alternatives can be found in the ***Architectural History Survey*** (VDOT, 2020i). There are five architectural resources within the APEs associated with the three alternatives either already listed on the NRHP or eligible for listing on the NRHP.

Table 3-12 lists the five architectural historic properties identified to date and notes the National Register eligibility criteria. The SHPO provided concurrence with the eligibility determination for the architectural resources listed below in October 2019 (see Appendix C).

Table 3-12. Resources Listed in, Eligible for, or Recommended Eligible for Listing on the NRHP

VDHR Number	Resource	Property Address	Eligibility Recommendations	National Register Eligibility Criteria	Alternative APE
044-0002	Belleview	3637 Joseph Martin Highway	NRHP Listed	C	A, B
044-0009	Marrowbone	1826 Lee Ford Camp	NRHP Eligible	C	B
044-5182	Patterson Cemetery	Unassigned	NRHP Eligible	D	A, B, C
044-5183	Price Cemetery	Route 689 (Reservoir Road)	NRHP Eligible	D	A, B, C
044-5188	Watkins Cemetery	Browns Dairy Road	NRHP Eligible	D	A, B, C

3.4.2.2 Archaeological Resources
No previously identified archaeological sites have been documented within the direct effects APE for Alternatives A, B, and C.

3.4.3 Environmental Consequences

3.4.3.1 Architectural Resources
In accordance with the requirements of Section 106 of the NHPA, VDOT has considered how the three alternatives retained for evaluation might affect the five architectural (above ground) historic properties located with the direct and indirect APE. Under the regulations implementing Section 106, an effect is an “alteration to the characteristics of a historic property qualifying it for the National Register” [36 CFR §800.16(i)]. An effect is adverse when it alters a qualifying characteristic of the property “in a manner that would diminish the integrity of the property’s location, design, setting, materials, workmanship, feeling, or association” [36 CFR 800.5(a)(1)]. The assessments of effect presented below are only preliminary and have not been coordinated with the SHPO and other consulting parties. As design and engineering of the Build Alternatives advances, these preliminary assessments will be taken into account and efforts will be made to avoid or minimize any adverse effects. These efforts will be undertaken in consultation with the SHPO and other consulting parties to the Section 106 process, who will also be provided the opportunity to comment on final determinations of effect.

Table 3-13 lists the five architectural historic properties identified to date and notes whether they are contained within the direct or indirect effects APE for each of the three build alternatives.

Table 3-13. Resources Listed in, Eligible for, or Recommended Eligible for Listing on the NRHP

VDHR Number	Resource	Property Address	Eligibility Recommendations	Alternative APE
044-0002	Belleview	3637 Joseph Martin Highway	NRHP Listed	A, B
044-0009	Marrowbone	1826 Lee Ford Camp	NRHP Eligible	B
044-5182	Patterson Cemetery	Unassigned	NRHP Eligible	A, B, C
044-5183	Price Cemetery	Reservoir Road	NRHP Eligible	A, B, C
044-5188	Watkins Cemetery	Browns Dairy Road	NRHP Eligible	A, B, C

Belleview (VDHR No. 044-0002), Belleview is within the direct effects APE for Alternatives A and B, as well as the indirect APE for Alternatives A and B. Alternatives A and B may diminish aspects of integrity that contribute to the eligibility of Belleview, resulting in an adverse effect. However, Belleview falls outside of the direct and indirect APE for Alternative C; therefore, this alternative may produce either a no effect or no adverse effect to the Belleview property.

Marrowbone (VDHR No. 044-0009), Marrowbone is within the direct and indirect APEs for Alternative B. Alternative B is likely to diminish the setting and feeling of the Marrowbone property resulting in an adverse effect to the historic property. However, Marrowbone does not fall within the direct or indirect APEs for Alternatives A and C; therefore, these alternatives may result in either a no effect or no adverse effect to the Marrowbone property.

Patterson Cemetery (VDHR No. 044-5182), The Patterson Cemetery is within the direct and indirect APEs for Alternatives A and B. A direct impact to the Patterson Cemetery from Alternatives A or B would constitute an adverse effect to the resource. Avoidance of direct impacts to the Patterson Cemetery may result in either a no effect or no adverse effect to the cemetery. The Patterson Cemetery is located within the indirect APE for Built Alternative C; therefore, this alternative may result in either a no effect or no adverse effect to the cemetery.

Price Cemetery (VDHR No. 044-5183), The Price Cemetery is within the indirect APE for Alternatives A, B, and C. The Price Cemetery is unlikely to be directly impacted by Alternatives A, B, or C; therefore, these alternatives may result in either a no effect or no adverse effect to the cemetery.

Watkins Cemetery (VDHR No. 044-5188), The Watkins Cemetery is within the indirect APE for Alternatives A, B, and C. The Watkins Cemetery is unlikely to be directly impacted by Alternative A, B, and C; therefore, these alternatives may produce either a no effect or no adverse effect to the cemetery.

3.4.3.2 Archaeological Resources

As allowed under the Section 106 regulations [36 CFR Part 800.4(b)(2)] when alternatives under consideration consist of corridors of large land areas, VDOT may choose to defer completion of the additional survey and evaluation efforts needed to ensure identification of all archaeological sites eligible for the NRHP that might be affected by the Martinsville Southern Connector until after the selection of a Preferred Build Alternative. From the information contained in the report, ***Phase I A Archaeological Survey*** (VDOT, 2020h), there are no previously identified archaeological sites located within the Martinsville Southern Connector direct effects APE for Alternatives A, B, or C.

The results of the Phase IA survey completed for the Martinsville Southern Connector conclude that the locations most likely to contain intact cultural deposits are those at the southern portion of the study area southeast of Greensboro Road, in the northern portion of the study area near Marrowbone Creek and its tributaries, and areas around historic farmsteads located throughout the project area. It appears that Alternative B has the highest probability for intact cultural deposits, followed by Alternative A, Alternative C has the lowest potential for intact cultural deposits. The SHPO concurred with the recommendations made in the Phase IA survey in October 2019.

However, VDOT has concluded that, in relation to their historic significance, any archaeological historic properties that might be affected by the Martinsville Southern Connector would meet the regulatory exception to the requirements of Section 4(f) approval: the sites would likely be important chiefly for the information they contain, which can be retrieved through data recovery, and would have minimal value for preservation in place [23 CFR 774.13(b)(1)]. These recommendations for archaeological survey have been coordinated with the SHPO and were concurred upon in October 2019.

3.4.4 Mitigation

Once the public has had an opportunity to review and comment on the Draft EIS, VDOT and FHWA will assess the effects of the Preferred Alternative on architectural historic properties and coordinate the findings with the SHPO and other Section 106 consulting parties. Should any of the architectural historic properties be adversely affected, FHWA and VDOT will consult with the SHPO and other consulting parties to the Section 106 process to determine appropriate measures that would avoid, minimize, or mitigate the adverse effects. These measures would constitute commitments that would be incorporated as stipulations in a legally binding agreement document executed by the FHWA, the SHPO, the ACHP, VDOT, and other parties as appropriate to conclude the Section 106 process. Presently, VDOT and FHWA anticipate that the agreement document would take the form of a project-specific Programmatic Agreement that would also stipulate the process VDOT would follow to complete efforts to identify archaeological historic properties potentially affected by the Preferred Alternative, assess the undertaking's effect on those sites, and identify measures that would resolve any adverse effects by avoiding, minimizing, or mitigating for them.

3.5 NATURAL RESOURCES

3.5.1 Surface Water Resources

3.5.1.1 Water Quality

Regulatory Context and Methodology

As directed by Section 305(b) of the Clean Water Act (CWA), the Virginia Department of Environmental Quality (VDEQ) monitors water quality in state waters, identifying impairments and sources of impairments, and developing and implementing Total Maximum Daily Load (TMDL) reports for impaired waters (§ 62.1-44.19:5 and § 62.1-44.19:7). A TMDL report is a study to determine the amount of a pollutant that the impaired water can assimilate and still meet water quality standards.

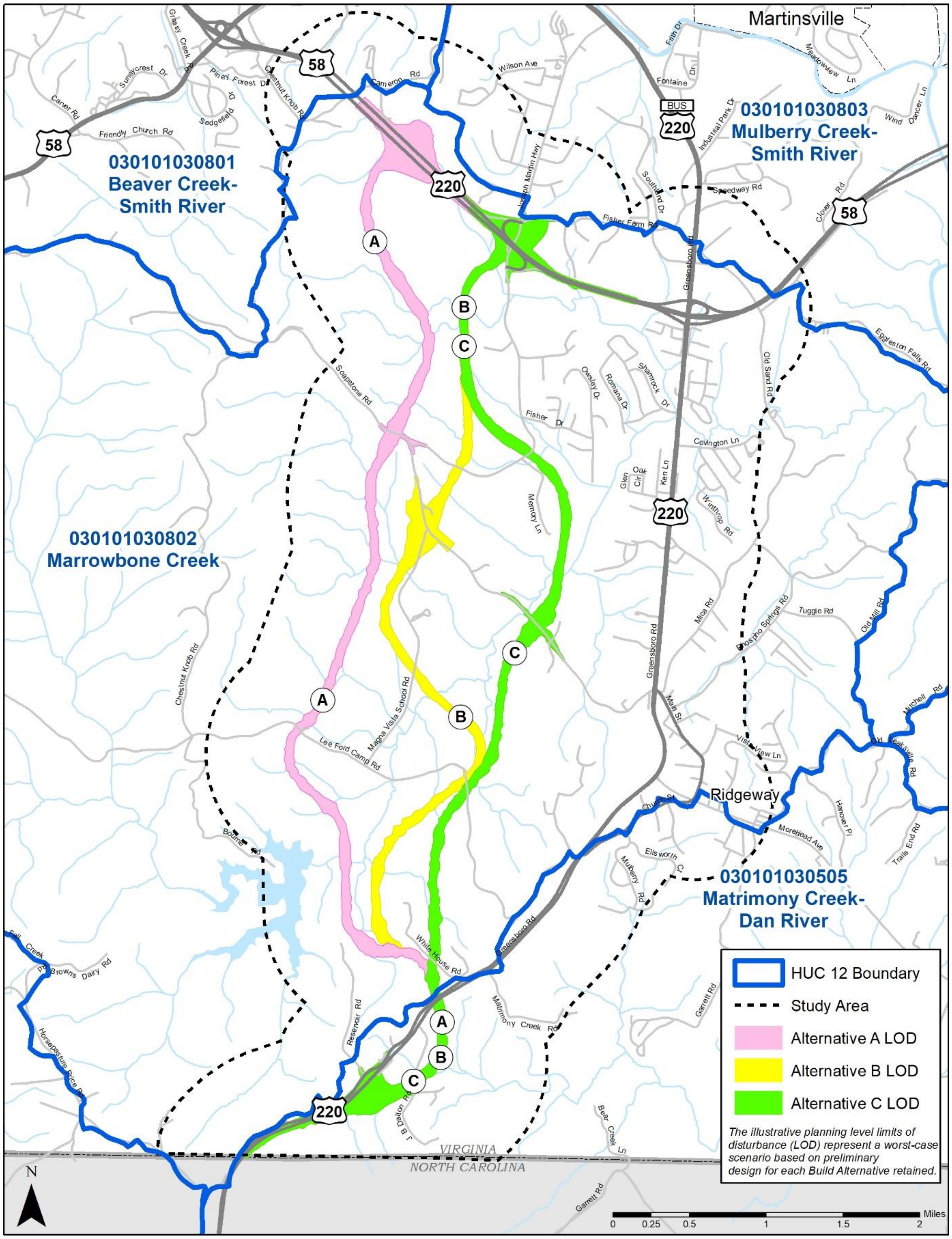
When surface waters fail to meet water quality standards sufficient to support designated use categories, the waters are classified as impaired waters under Section 303(d) of the CWA. Freshwater rivers and surface waters in Virginia are evaluated biennially on the water's ability to support the following six designated use categories: Recreation, Aquatic Life, Fish Consumption, Shellfish Harvest, Public Water Supply, and Wildlife. These regulations are relevant for this analysis because the Build Alternatives could result in impacts to water quality.

Water quality was evaluated within the watersheds intersected by the Alternative Inventory Corridors using VDEQ's *Draft 2018 305(b)/303(d) Water Quality Assessment Integrated Report* (VDEQ, 2018). VDEQ released this report on January 22, 2018. The 2018 Integrated Report is a summary of the water quality conditions in Virginia from January 1, 2011, through December 31, 2016 (VDEQ, 2018). The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

Affected Environment

The study area is located within the Upper Dan River subbasin (hydrologic unit code (HUC) 03010103), more specifically, the Lower Smith River (HUC 0301010308) and the Dan River-Matrimony Creek (HUC 0301010305) watersheds (VDCR, 2019a). The majority of the study area is in the Lower Smith River watershed. Within these two larger watersheds, there are two subwatersheds within the Alternative Inventory Corridors: Marrowbone Creek (HUC 030101030802) and Matrimony Creek (HUC 030101030505) (**Figure 3-10**).

Figure 3-10: Watersheds



All drainage within the study area flows to the Dan River, which flows to the Roanoke River, and ultimately to the Albemarle Sound. Surface waters in the Alternative Inventory Corridors consist of Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, other perennial, intermittent, and ephemeral streams, open waters, and wetlands. **Table 3-14** is a summary of HUC for the study area.

Table 3-14: Summary of Hydrologic Unit Codes (HUC) for the Study Area

Subbasin (HUC 8)	Watershed (HUC 10)	Sub-Watershed (HUC 12)	Tributaries
Upper Dan River (03010103)	Lower Smith River (0301010308)	Marrowbone Creek (030101030802)	Little Marrowbone Creek
			Marrowbone Creek
			Stillhouse Run
	Dan River-Matrimony Creek (0301010305)	Matrimony Creek (030101030505)	Matrimony Creek

<u>Marrowbone Creek Watershed</u>

The Marrowbone Creek watershed encompasses most of the study area. Land cover is primarily forest and agriculture throughout, except along the Route 220 corridor. Moving away from the Route 220 corridor, the watershed becomes increasingly less developed with forested land eventually becoming the dominant land cover. Observations made in the field identified areas where recent (within the last 20 years) timber harvests have occurred. It was determined Alternative Inventory Corridors A, B and C each have tracts of land that had been logged for timber. Specifically, there is an area of recent timber harvest at the Route 58 interchange as well as another harvested area, that is regenerating, just north of the northern interchange with existing Route 220 and Route 58. Stream quality is greatly affected by timber harvesting and logging operations in the watershed. Disturbance to the surrounding landscape caused by forest operations such as timber harvests, road and skid trail construction, landing construction, skidding of logs, and movement of machinery in and out of different operating sites create conditions that increase runoff, increase raindrop erosion, and reduced canopy cover. The streams suffer the effects of frequent clearcutting timber harvests with minimal to no erosion and sediment control measures. Incised stream channels and bank instability, caused by increased volumes of water in the streams, are evidence of these effects and are documented in data sheets found in the ***Natural Resources Technical Report*** (VDOT, 2020d).

The first 4.5 river miles of Marrowbone Creek are currently not meeting Virginia's water quality standard for Recreational Use, due to high levels of bacteria (*E. coli*). VDEQ has included Marrowbone Creek on Virginia's 2018 303d list for bacterial impairment. This reach extends from its confluence with Smith River, continuing upstream, stopping short of Soapstone Road and terminating to the east of the Alternative Inventory Corridors. Failed septic systems, open sewage, livestock direct instream loading, as well as agricultural and urban nonpoint sources are the identified sources for impairment (VDEQ, 2018). VDEQ's Virginia Environmental Geographic Information Systems (VEGIS) map service shows that VDEQ developed a TMDL for *E. coli* that was approved by EPA in 2008.

<u>Matrimony Creek Watershed</u>

The Matrimony Creek Watershed encompasses a relatively small area at the southern extent of the study area. Like Marrowbone Creek, land cover is primarily forest and agriculture throughout. Matrimony Creek is not included on Virginia's 303d list. VDEQ's VEGIS map service indicates that Matrimony Creek Mainstem is fully supporting its designated uses; however, there is not enough current data to characterize its upstream tributaries.

Environmental Consequences

No-Build Alternative

The No-Build conditions are consistent with the existing predevelopment conditions. Existing infrastructure has impacted water quality (e.g. construction of roads, timber harvesting, surrounding development, etc.). In the absence of modern stormwater management system improvements that would be associated with construction of one of the Build Alternatives, the current impacts to water quality would be anticipated to continue under the No-Build Alternative.

Alternative A

Alternative A would intersect approximately 70 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of these stream reaches are classified VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to *E.coli* from septic systems and agricultural sources, and not transportation sources, implementation of Alternative A is unlikely to worsen existing impaired waters.

Alternative A would introduce approximately 8.3 miles of impervious surface to a low-development area. If left untreated, long-term minor water quality impacts could occur as a result of increases in impervious surfaces. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could also amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surfaces can substantially increase ambient temperatures in receiving streams. Paved surfaces transfer substantial amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing Virginia Stormwater Management Program (VSMP) regulations (9VAC25-870), Alternative A would maintain water quality and quantity post-development equal or better than pre-development. Alternative A would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces of the six roads that intersect with the LOD. During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater Best Management Practices (BMPs) would be designed as improvements advance from the study and would be implemented to minimize the negative impacts of various pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

Alternative B

Alternative B would intersect approximately 60 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of these stream reaches are classified VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to *E.coli* from septic systems and agricultural sources, and not transportation sources, implementation of Alternative B is unlikely to worsen existing impaired waters.

Alternative B would introduce approximately 7.7 miles of impervious surface to a low-development area. If left untreated, long-term minor water quality impacts could occur as a result of increases in impervious surfaces. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surface can substantially increase ambient temperatures in receiving streams. Paved surfaces transfer substantial amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), Alternative B would maintain water quality and quantity post-development equal or better than pre-development. Alternative B would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces of the eight roads that intersect with the LOD. During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater BMPs would be designed as improvements advance from the study and would be implemented to minimize the negative impacts of various pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

Alternative C (Preferred Alternative)

Alternative C would intersect approximately 60 stream reaches. Water quality within these stream reaches could be impacted during construction through erosion and sedimentation, construction of culverts/bridges, and accidental material spills. Runoff from the construction site has the potential to erode disturbed soils, resulting in sedimentation of adjacent waterways. None of these stream reaches are classified VDEQ impaired waterways; however, a portion of Marrowbone Creek just west of 220 is classified as an impaired waterway by VDEQ. Since Marrowbone Creek is classified as impaired due to *E.coli* from septic systems and agricultural sources, and not transportation sources, implementation of Alternative C is unlikely to worsen existing impaired waters.

Alternative C would introduce approximately 7.4 miles of impervious surface to a low-development area. If left untreated, long-term minor water quality impacts could occur as a result of increases in impervious surfaces. The additional impervious surfaces would increase the volume and speed of surface runoff entering nearby waters, causing erosion and sedimentation, depositing sediment and pollutants into nearby surface waters, and stressing or displacing stream inhabitants. Additionally, without proper stormwater controls, increased volumes of runoff could also amplify the frequency and severity of local flooding due to reduced area and time for infiltration or percolation into the soil / natural environment. Runoff from impervious surface can substantially increase ambient temperatures in receiving streams. Paved surfaces transfer substantial amounts of thermal energy to runoff passing over it. When this warmed runoff reaches the receiving stream, a rise in temperature of just a few degrees can have an adverse impact on aquatic life (VDCR, 1999). Runoff from impervious surfaces includes pollutants washed from the road and bridge surfaces and associated pollutants from increased traffic and road maintenance, such as those associated with accidental fuel spills, vehicle wear and emissions, and chemicals used for road maintenance. Pollutants associated with such activities and runoff from roadways include heavy metals, salt and other de-icing agents, organic compounds, roadside herbicides, and nutrients. Vehicle-related particulates in highway runoff come mostly from tire and pavement wear, from engine and brake wear, and from settleable exhaust (Nixon and Saphores, 2003).

In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), Alternative C would maintain water quality and quantity post-development equal or better than pre-development. Alternative C would implement permanent stormwater management facilities to address the new impervious surfaces as well as the existing impervious surfaces of the eight roads that intersect with the LOD. During construction, the contractor would be required to adhere to strict erosion and sediment control and stormwater measures and the associated required monitoring protocols, as specified in the State Water Control Law. Temporary stormwater BMPs would be designed as improvements advance from the study and would be implemented to minimize the negative impacts of various pollutants that can be carried by runoff into the groundwater and receiving waters in accordance with Virginia's State Water Control Law.

Mitigation

Post-construction impacts to water quality would be minimized and avoided through implementation of stormwater management plans. In accordance with Virginia's State Water Control Law (COV Title 62.1, Chapter 3.1) and implementing VSMP regulations (9VAC25-870), implementation of any Build Alternative would maintain water quality and quantity post-development equal or better than pre-development. Stormwater control measures would be designed to treat or store polluted stormwater before entering nearby streams. Design of stormwater control measures would take into account any projected increase in stormwater runoff so that the speed of treated runoff entering nearby streams would be the same as the runoff rate that was entering the stream before development.

Stormwater management BMPs would be implemented to avoid and minimize water quality impacts. These BMPs would be designed using the VSMP requirements and VDEQ standards for Virginia Runoff Reduction Method practices, coupled with VDOT BMP Standards and Special Provisions. Erosion and sediment control measures and post-construction stormwater treatment would minimize impacts from increases in impervious surfaces, mitigate increases in runoff volume, and satisfy requirements to reduce pollutant loads below existing baseline conditions, as required by the VSMP regulations and Chesapeake Bay TMDL. This would minimize any increases in contaminants which could cause impairment of the area waterbodies.

The stormwater management plans would include certain common elements. As required under the current VSMP stormwater management criteria and new BMP standards, stormwater management measures would not only treat newly developed lands but would also treat and reduce phosphorus loads from existing lands by 20 percent, including impervious surfaces not previously addressed under previous regulations. Newly developed lands would be treated by stormwater management measures such that the post-development phosphorus load does not exceed 0.41 pounds/acre/year. Due to the limited options for SWM on the bridge structures and the limited land within the right of way along the surface roadways, these areas may be treated through offsite options, such as nutrient trading.

3.5.1.2 Waters of the U.S. Including Wetlands

Regulatory Context and Methodology

Executive Order 11990, Protection of Wetlands, established a national policy and mandates that each Federal agency take action to minimize the destruction, loss or degradation of wetlands, and to preserve and enhance their natural value.

U.S. Army Corps of Engineers (USACE) exerts regulatory authority over activities involving the discharge of dredged or fill material into Waters of the U.S. (WOUS) pursuant to Section 404 of the CWA, as amended (33 USC 1344). The VDEQ administers the Virginia Water Protection Permit (VWPP) Program for impacts to surface waters (9 VAC §25-210 and Section 401 of the CWA). The Virginia Marine Resources Commission (VMRC) regulates encroachment into state-owned submerged lands (4 VAC §20). These regulations are relevant for this analysis because the Build Alternative could result in impacts to WOUS.

In order to identify the potential WOUS, including wetlands, that could be present within the study area, an in-office review of available resource information was conducted. Data reviewed included: the U.S. Fish and Wildlife Service' (USFWS) National Wetlands Inventory (NWI) mapping (USFWS, 2017); the National Hydrography Dataset (NHD) and 7.5-minute topographic quadrangles prepared by the United States Geographical Survey (USGS) (USGS, 2017); U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) soils mapping and survey reports (USDA-NRCS 2018); and natural color aerial imagery. WOUS that were identified as a result of this desktop review were used as the basis to compare potential WOUS impacts among alternatives. Mapping of the desktop inventory was provided for public and agency review prior to requesting Cooperating Agency concurrence on the alternatives retained for evaluation.

Following agency concurrence on the range of alternatives to be retained for evaluation, a formal field delineation of WOUS within the Alternative Inventory Corridors, was conducted between February and May of 2019 to provide a more refined estimate of potential WOUS impacts associated with each alternative. WOUS were field-delineated within the Alternative Inventory Corridors for each alternative, following the methods described in the 1987 USACE *Wetland Delineation Manual (1987 manual)* (USACE 1987) and in the *2012 Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)* (USACE, 2012). During the development of the Final EIS, a preliminary Jurisdictional Determination will be obtained so that a JPA can be prepared and submitted to VDEQ and USACE. Detailed information regarding the identification of WOUS, including wetlands, can be found in the ***Natural Resources Technical Report*** and supporting technical appendices (VDOT, 2020d).

Wetland Functions and Values Determination

A qualitative assessment of wetland functions and values, consistent with the *Highway Methodology Workbook Supplement: Wetland Functions and Values – A Descriptive Approach*, referred to herein as the Highway Methodology, was prepared using desktop resources and information gathered in the field (USACE, 2015).

Wetland functions and values describe the services that a wetland performs that benefit the wetland, the watershed within which the wetland is located, and the surrounding ecosystem. Functions are self-sustaining properties of a wetland ecosystem that exist in the absence of society and result from both living and non-living components of a specific wetland. These include all processes necessary for self-maintenance of the wetland ecosystem such as primary production and nutrient cycling. Values are the benefits that derive from one or more function and the physical characteristics associated with a wetland (USACE, 1999).

The Highway Methodology was used to evaluate wetland functions and values within each Alternative Inventory Corridor. This methodology was concurred upon by the Cooperating Agencies early in the stages of the study development. This descriptive approach uses qualitative characteristics to determine the functions and values of each wetland. A pre-established list of considerations or qualifying criteria based on those outlined in the Highway Methodology served as guidance in determining the suitability of each function and value. The functions and/or values evaluated include those that serve an important physical component of a wetland ecosystem and/or are considered of special value to society from a local, regional, and/or national perspective. Wetland functions and values within the study area were determined based on best professional judgement using existing literature and mapping including Federal Emergency Management Agency (FEMA) floodplain, NWI, NRCS soil surveys, and threatened and endangered species mapping, as well as field data collected during the wetland delineation. A more detailed explanation of the wetlands functions and values determination can be found in the ***Natural Resources Technical Report*** (VDOT, 2020d).

Unified Stream Methodology

Streams were qualitatively assessed using the 2007 Unified Stream Methodology (USM) that was developed for use in Virginia by USACE and the VDEQ. The USM provides a rapid method to assess stream compensatory mitigation requirements for projects seeking authorization to impact jurisdictional streams, as well as the number of credits generated by mitigation projects. A more detailed explanation of the USM can be found in the ***Natural Resources Technical Report*** (VDOT, 2020d).

Affected Environment

The delineated WOUS within the Alternative Inventory Corridors are comprised of streams and vegetated floodplain wetlands. Wetlands that are contiguous or adjacent to streams occur in areas of poor drainage and as seeps along the toe of steep slopes. Surface waters in the Alternative Inventory Corridors consist of Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, unnamed perennial, intermittent, and ephemeral streams, open waters, and wetlands. The wetland systems (which are predominantly forested and emergent systems) within the study area are located along stream channels. See **Figure 3-11** for mapping of wetlands and waterways. The total linear feet (lf) and acres of streams and wetlands, respectively, delineated within the Alternative Inventory Corridors is shown in **Table 3-15**. More detailed WOUS mapping for the Preferred Alternative will be provided and a preliminary Jurisdictional Determination will be obtained during the permitting process in conjunction with the preparation of the Final EIS.

Wetlands

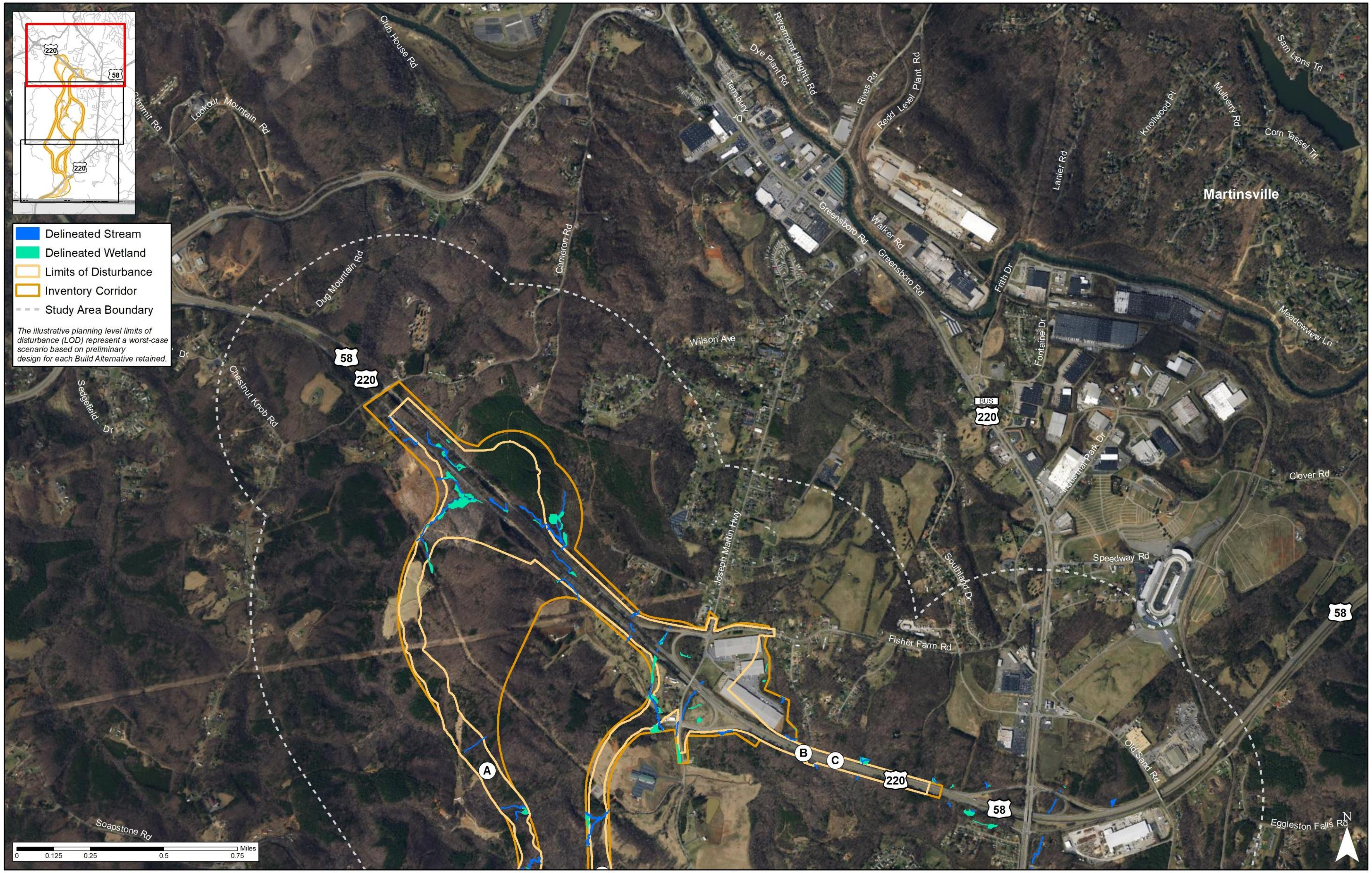
Wetlands were delineated within the Marrowbone Creek and Matrimony Creek watersheds. Wetlands were identified primarily within the active floodplains associated with Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, and Matrimony Creek and their tributaries with a relatively even distribution within these watersheds. The wetland delineation findings, including data forms and functional assessments, are included in the ***Natural Resources Technical Report*** (VDOT, 2020d). The wetlands delineated within the Alternative Inventory Corridors are comprised of palustrine emergent (PEM), palustrine scrub-shrub (PSS), palustrine forested (PFO), and palustrine open water (POW) wetlands. The total acreage of wetlands delineated within the Alternative Inventory Corridors are: Alternative A (10.7 acres), Alternative B (9.0 acres) and Alternative C (7.0 acres) (see **Table 3-15**).

Table 3-15: Delineated Water Resources within the Alternative Inventory Corridors

Resource	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Streams			
Ephemeral (lf)	5,993	3,039	4,325
Intermittent (lf)	10,544	13,953	13,611
Perennial (lf)	29,014	18,290	19,041
Total (lf)	**55,551**	**35,282**	**36,977**
Wetlands			
PEM (acres)	3.6	2.9	2.7
PSS (acres)	0.8	0.8	0.2
PFO (acres)	4.9	4.0	3.2
POW (acres)	1.4	1.3	0.9
Total acres	**10.7**	**9.0**	**7.0**

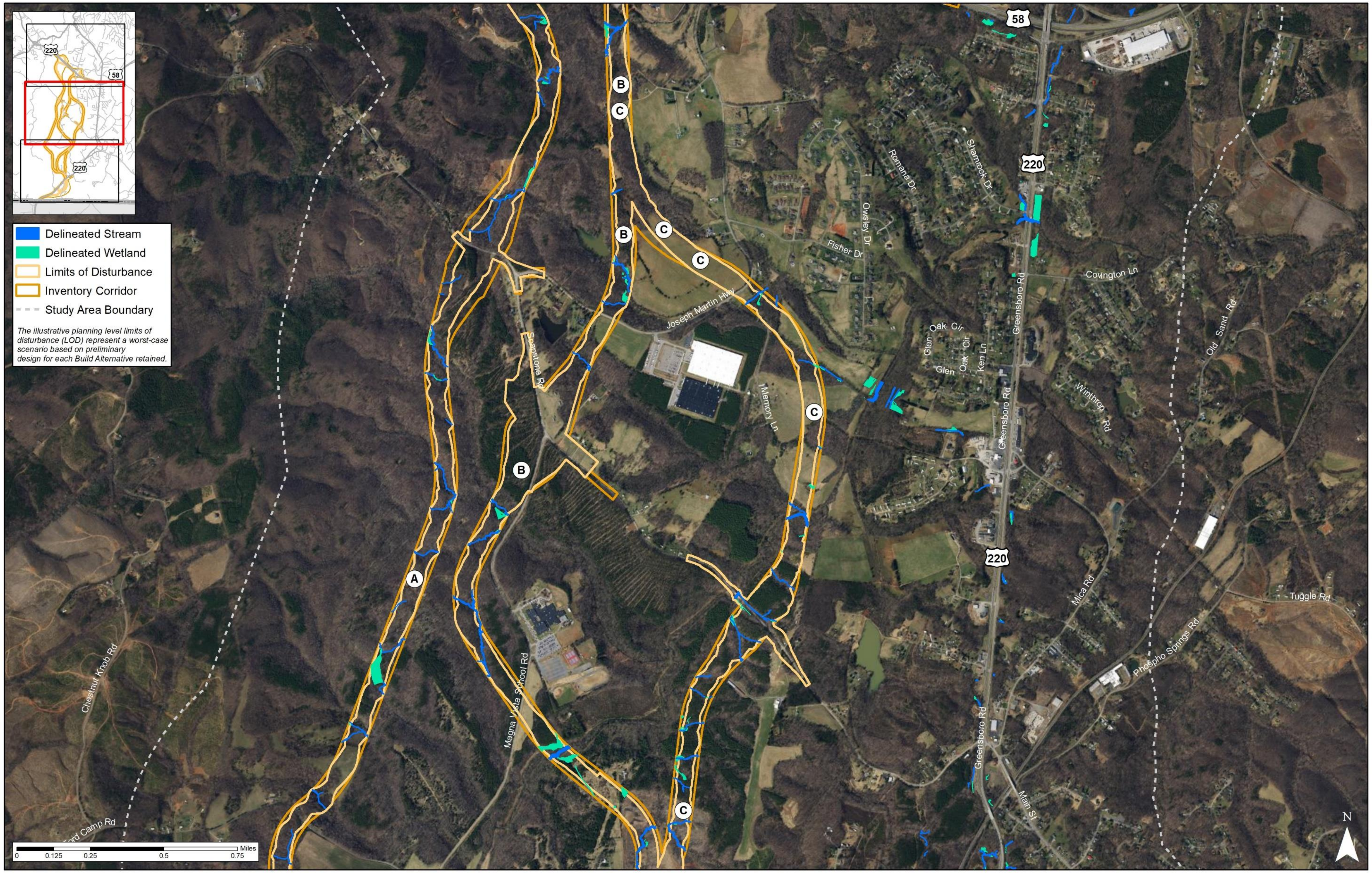
Note: Shaded column denotes Preferred Alternative.

Figure 3-11: Delineated Resource Maps



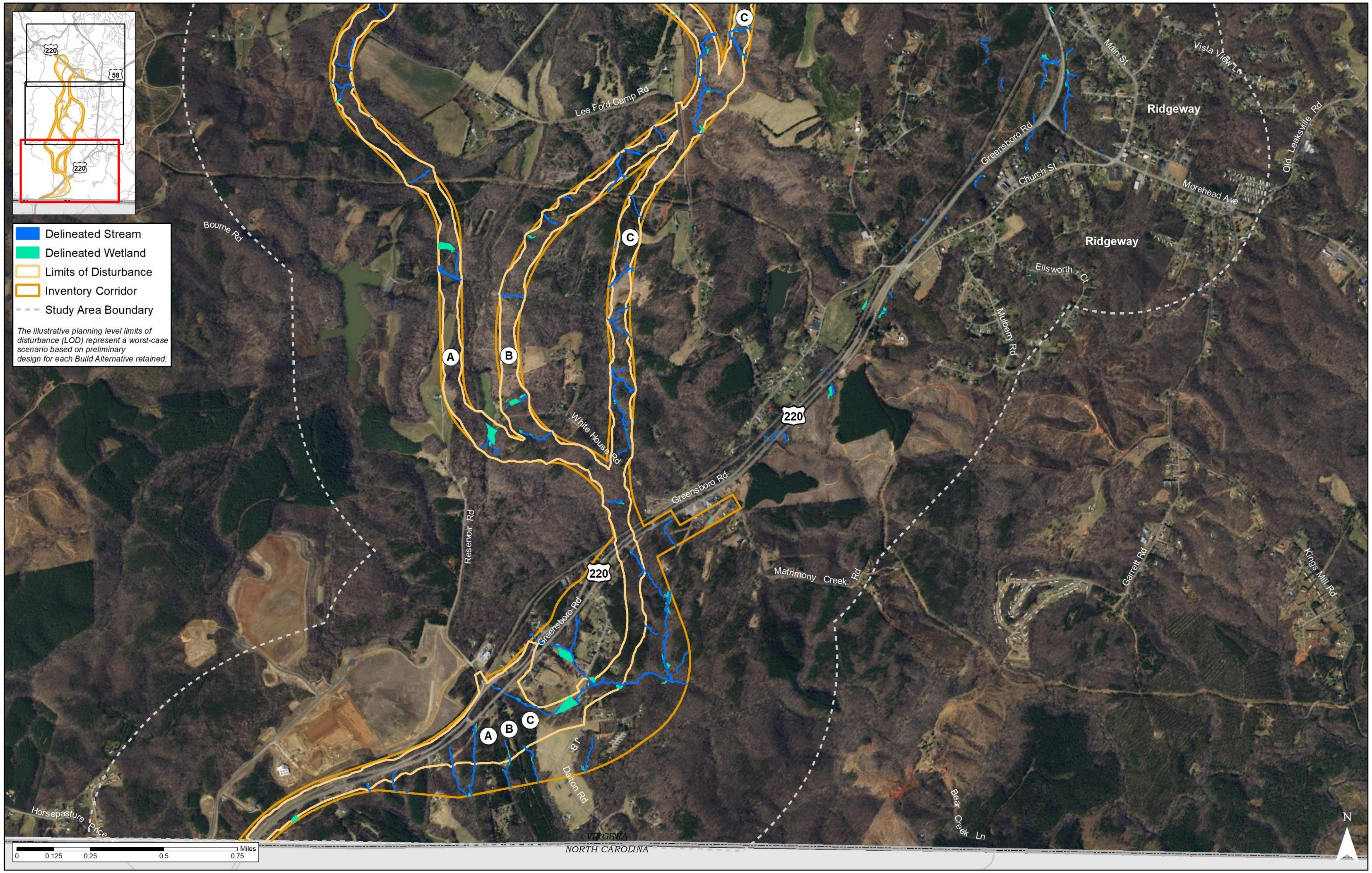
Note: Figure depicts additional resources that occur along Route 220, which were delineated prior to the decision not to retain Alternatives D and E from further evaluation. Additional information regarding these resources is included in the ***Natural Resources Technical Report*** *(VDOT 2020d).*

Figure 3-7: Delineated Resource Maps (cont.)



Note: Figure depicts additional resources that occur along Route 220, which were delineated prior to the decision not to retain Alternatives D and E from further evaluation. Additional information regarding these resources is included in the ***Natural Resources Technical Report*** *(VDOT, 2020d).*

Figure 3-7: Delineated Resource Maps (cont.)



Note: Figure depicts additional resources that occur along Route 220, which were delineated prior to the decision not to retain Alternatives D and E from further evaluation. Additional information regarding these resources is included in the ***Natural Resources Technical Report*** *(VDOT, 2020d).*

Functions and Values of Delineated Wetlands

Functions and values of wetlands are influenced by many factors including, but not limited to, size and proximity of wetlands to ongoing development activity, geologic setting, soil characteristics, presence and duration of hydrology, landscape position, vegetation cover type, and dominant ecological community type. The following describes the functions and values of the wetlands delineated within the Alternative Inventory Corridors.

- *Groundwater Recharge/Discharge*: Most wetlands serve a role in groundwater recharge/discharge due to the integral relationship between wetlands, aquifers, and water table fluctuations. Groundwater discharge within the Alternative Inventory Corridors may be found in muck, loam, and clay loam soils. Wetland and stream discharge typically occurs when the water table is high relative to the elevation of the waterbody. Groundwater recharge in the Alternative Inventory Corridors is driven by direct precipitation onto the land, seepage, and subsurface flow. Wetlands in the Alternative Inventory Corridors that contribute to groundwater discharge and recharge typically show signs of variable water table levels, including redoximorphic features in the soil, saturation, ponded water, and water stained leaves. Because most Alternative Inventory Corridor wetlands contain the features listed above, groundwater recharge/discharge is considered a principal function of Alternative Inventory Corridor wetlands. Examples of Groundwater Recharge/Discharge characteristics were exhibited in representative wetlands including W-T, W-83, and W-211. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Flood-flow Alteration*: Wetlands connected to floodplains have the ability to affect downslope flood-flow through attenuation of stormwater flows. There are many wetlands adjacent to waterbodies within the Alternative Inventory Corridors. Flood-flow alteration is considered a principal function for wetlands in the Alternative Inventory Corridors and is one of the most recorded functions. Examples of Flood-flow Alteration were exhibited in representative wetlands including W-BQ, W-166, W-170, and W-241 associated with intermittent and perennial streams. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Sediment/Toxicant/Pathogen Retention*: Wetlands within the Alternative Inventory Corridors retain excessive sediments, toxicants, and pathogens. Slowly-drained fine-grained soils hold pollutants. Dense vegetation commonly found in the PFO and PEM wetlands assists in trapping sediment. PUBs retain sediment, toxicants, and pathogens. These wetland features prevent sediment, toxicants, and pathogens from downstream transport, and thus should be considered a principal function. Examples of Sediment/Toxicant/Pathogen Retention were exhibited in representative wetlands including W-83, W-84, and W-255 associated with intermittent and perennial streams. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Nutrient Removal/Retention/Transformation*: Wetlands within the Alternative Inventory Corridors are suitable for nutrient removal/ retention/ transformation. These wetlands share many characteristics that also assist in the function of sediment/toxicant/pathogen retention, including ponded water, slowly-drained fine-grained soils, and dense herbaceous vegetation. Vegetation allows for uptake, retention, and transformation of nutrients in wetland systems. Nutrient removal/retention/transformation is important in helping reduce the input of excess nutrients to downstream waterbodies. Consequently, nutrient removal/retention/ transformation should be considered a principal function of the wetlands found in the Alternative Inventory Corridors. Examples of Nutrient Removal/Retention/Transformation were exhibited in representative wetlands including W-I, W-DC, and W-228. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).

- *Production Export*: Wetlands typically have high productivity levels and are generally associated with providing food for wildlife and other living organisms. High trophic level wildlife consume and export vegetation, invertebrates, and/or other wildlife for use by lower trophic levels within the wetland. Wetlands within the Alternative Inventory Corridors are composed of relatively homogenous ecological systems. PFO wetlands generally contain green ash, American sycamore, red maple, pawpaw, and spicebush, which are food sources for wildlife. PEM wetlands may serve this function because of the use of flowering plants by nectar and pollen-gathering insects. The ponded and seasonally inundated wetlands within the Alternative Inventory Corridors may serve as breeding grounds for insects that are consumed by bats, birds, and other insects. Production export is considered a principal function of the wetlands found within the Inventory Corridor. Examples of Production Export were exhibited in representative wetlands including W-217, W-228, and W-113. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Sediment/Shoreline Stabilization*: Most wetlands that border perennial/intermittent streams function in sediment/shoreline stabilization. Nearly all wetlands associated with Alternative Inventory Corridor streams have an unmaintained buffer comprised of woody vegetation that absorbs energy during flood events. The unmaintained buffer stabilizes stream banks from erosive forces. Although some of the stream banks are vertical and lack vegetation, the root systems of mature trees near the streams serve to keep banks stable. Sediment/shoreline stabilization is considered a principal function of the wetlands located adjacent to, or upstream of, the streams within the Alternative Inventory Corridors. Maintained wetlands or wetlands not adjacent to streams do not have sediment/shoreline stabilization as a principal function. Examples of Sediment/Shoreline Stabilization were exhibited in representative wetlands including W-T, W-W, and W-218/W-219. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Wildlife Habitat*: Wetlands within the Alternative Inventory Corridors contain habitat for a variety of wildlife species. Wildlife habitat is considered a principal function of wetlands within the Inventory Corridor. Examples of Wildlife Habitat were exhibited in representative wetlands including W-8, W-13, and W-60. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Recreation*: Wetlands can provide opportunities for enjoyment to the community. The wetlands within the Alternative Inventory Corridors do not have public access or parking. Recreation is not considered a principal value for Alternative Inventory Corridor wetlands. Examples of Recreation were exhibited in representative wetlands including W-224, W-228, and W-79. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Educational/Scientific Value*: The wetlands within the Alternative Inventory Corridors are located primarily on private property without public access or parking; however, there is a relatively large wetland within Alternative B that is near Magna Vista High School, easily accessible from Magna Vista School Road and meets this functions and values criteria. Apart from this wetland near Magna Vista High School, wetlands within the Alternative Inventory Corridors have little educational/scientific value. Examples of Educational/Scientific Value were exhibited in representative wetlands including W-217, W-228, and W-BT. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Uniqueness/Heritage*: As evidenced by the current field delineations, wetlands within the Alternative Inventory Corridors do not contain unique vegetation. There are no architecture or archaeological resources within Alternative Inventory Corridor wetlands. Therefore, uniqueness/heritage is not considered a principal value for the wetlands within the Inventory Corridor. Examples of Uniqueness/Heritage were exhibited in representative wetlands including W-217, W-141, and W-217. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).

- *Visual Quality/Aesthetics*: The wetlands within the Alternative Inventory Corridors meet some of the criteria for visual quality/aesthetics, however, they lack publicly-accessible viewing locations and are not easily accessed. Therefore, visual/aesthetics is not considered a principal value for the wetlands within the Alternative Inventory Corridors. Examples of Visual Quality/Aesthetics were exhibited in representative wetlands including W-228, W-CO, and W-241. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).
- *Threatened or Endangered Species Habitat*: In general, wetlands can provide habitat for numerous species, including State and Federal threatened or endangered species. Examples of Threatened or Endangered Species Habitat were exhibited in representative wetlands including W-AO, W-237, and W-64. For more information see **Appendix C** of the ***Natural Resources Technical Report*** (VDOT, 2020d).

The principal wetland functions and values identified within the inventory corridors for Alternatives A, B, and C, based on the *The Highway Methodology Workbook Supplement* included Groundwater Recharge/Discharge, Floodflow Alteration, Sediment/Toxicant Retention, Nutrient Removal, and Wildlife Habitat. Additional functions within Alignment A included Fish and Shellfish Habitat; Alignment B included Fish and Shellfish Habitat, Production Export, Educational/Scientific Value, Uniqueness/Heritage, and Visual Quality/Aesthetics; and within Alignment C included Educational/Scientific Value. **Table 3-16** shows the most common principal functions for wetlands for Alternative A, B, and C.

Table 3-16: Principal Functions and Values of Wetlands within Alternative Inventory Corridors

Principal Function/Value	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Groundwater Recharge/Discharge	✓	**X**	**X**
Floodflow Alteration	**X**	**X**	**X**
Fish and Shellfish Habitat	✓	✓	
Sediment/Toxicant Retention	✓	✓	✓
Nutrient Removal	✓	✓	✓
Production Export		✓	
Sediment/Shoreline Stabilization			
Wildlife Habitat	**X**	✓	✓
Recreation			
Educational/Scientific Value		✓	✓
Uniqueness/Heritage		✓	
Visual Quality/Aesthetics		✓	
Endangered Species Habitat			
Other			

Note: Shaded column denotes Preferred Alternative. Bold X indicates the most common principal functions.

As shown in **Table 3-16**, the most common principal functions for wetlands within Alternative A are floodflow alteration wildlife habitat. Within Alternatives B and C, groundwater recharge/discharge and floodflow alteration were most common. For impact discussions related to floodplains, groundwater, and wildlife, refer to **Sections 3.5.2**, **3.5.3**, and **3.5.4** respectively.

Streams

Streams were delineated within the Marrowbone Creek and Matrimony Creek watersheds and were primarily associated with Little Marrowbone Creek, Marrowbone Creek, Stillhouse Run, and Matrimony Creek. The stream delineation findings are included in the ***Natural Resources Technical Report*** (VDOT, 2020d). The total linear feet of streams delineated within the Alternative Inventory Corridors are: 55,551 linear feet (Alternative A), 35,282 linear feet

(Alternative B) and 36,977 linear feet (Alternative C) (see **Table 3-15**). Refer to **Section 3.5.1.1 Water Quality** for information regarding the condition of the streams.

Environmental Consequences

No-Build Alternative

Existing infrastructure, development and land management have impacted WOUS. No additional impacts to WOUS would be anticipated under the No-Build Alternative.

Alternative A

Construction of Alternative A would result in the loss of approximately 7.8 acres of wetlands and 28,998 linear feet of streams (impacts assumed no bridging) (see **Table 3-17**). The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. While wetlands and WOUS impacts would potentially result from filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments, traditional navigability waterways would not be impacted. Overall, the wetlands associated with this alternative are primarily PFO wetlands, 3.3 acres. The greatest impact to wetlands and streams would occur at the northern extent of the alternative (Route 58 interchange) and the areas south of Soapstone Road. Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of temporary construction and conversion impacts would be completed once more detailed phases of project development and construction methods are developed as required by CWA permit process. The majority of wetlands along this alternative provide a high degree of floodflow alteration, groundwater recharge/discharge, sediment retention, wildlife habitat and nutrient removal. Alternative A would impact approximately 1.4 acres of POW. These systems typically provide high amounts of flood relief and nutrient/sediment storage; however, the full effect of this impact is not yet known.

Table 3-17: Estimated Impacts to Water Resources within each LOD*

Resource	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Streams			
Ephemeral (lf)	3,485	1,218	2,176
Intermittent (lf)	5,902	8,265	7,717
Perennial (lf)	19,611	11,065	11,989
Total (lf)	**28,998**	**20,548**	**21,882**
Wetlands			
PEM (acres)	2.3	1.3	1.0
PSS (acres)	0.8	0.7	0.2
PFO (acres)	3.3	2.7	1.6
POW (acres)	1.4	1.2	0.9
Total acres	**7.8**	**5.9**	**3.7**

Note: Shaded column denotes Preferred Alternative.
Sources: VDOT, 2019d
**In order to illustrate a worst-case scenario, impacts reported were estimated assuming no bridging. The type of bridge will be determined during more detailed design.*

Alternative B

Construction of Alternative B would result in the loss of approximately 5.9 acres of wetlands and 20,548 linear feet of streams (impacts assumed no bridging) (see **Table 3-17**). The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. While wetlands and

WOUS impacts would potentially result from filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments, traditional navigability waterways would not be impacted. Overall, most of the impacts associated with Alternative B would occur south of Soapstone Road. However, the evaluated Route 58 and Route 220 interchanges would contribute to a number of localized impacts to both streams and wetlands.

Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of temporary construction and conversion impacts would be completed as more detailed phases of project development and construction methods are developed as required by CWA permit process. Most of the wetlands are providing a high degree of floodflow alteration, groundwater recharge/discharge and wildlife habitat. There is one wetland within Alternative B that can provide educational or scientific value. This wetland is located within 200 feet of Magna Vista Road, has both PFO and PEM wetland classifications, is easily visible from primary viewing locations and is approximately 1,800 feet away from Magna Vista High School. Alternative B would impact (approximately 1.2 acres of POW). These systems typically provide high amounts of flood relief and nutrient/sediment storage however, the full effect of this impact is not yet known.

Alternative C (Preferred Alternative)
Construction of Alternative C would result in the loss of approximately 3.7 acres of wetlands and 21,882 linear feet of streams (impacts assumed no bridging), respectively (see **Table 3-17**). The wetland and WOUS impacts are a result of filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments. While wetlands and WOUS impacts would potentially result from filling for roadway embankments, culverted stream crossings, stormwater management facilities, and bridge approaches/abutments, traditional navigability waterways would not be impacted. Most of the impacts associated with Alternative C would occur south of Soapstone Road. Temporary impacts could occur from construction-related activities and conversion of wetlands from one vegetation class to another. An assessment of temporary construction and conversion impacts would be completed once more detailed phases of project development and construction methods are developed as required by the CWA permit process. The primary wetland functions and values of the wetlands that would be affected within this alternative include groundwater recharge/discharge and floodflow alteration. Most wetlands within Alternative C are relatively small and receive surface water input from periodic flooding of Marrowbone Creek and its tributaries. Alternative C would impact approximately 0.9 acres of POW. These systems typically provide high amounts of flood relief and nutrient/sediment storage; however, the full effect of this impact is not yet known.

Alternative C has been identified as the preliminary Least Environmentally-Damaging Preferred Alternative (LEDPA) based on concurrence from USACE and EPA. Section 404 of the CWA requires selection and authorization of the LEDPA; and determination from the USACE that there is no other practicable alternative which would have less adverse impact on the aquatic ecosystem. USACE's formal identification of the LEDPA is a determination made as part of a permit decision, which is anticipated to occur under the One Federal Decision (OFD) process for the Martinsville Southern Connector Study.

Mitigation
As the design and engineering of the Preferred Alternative advances, minor alignment shifts and consideration of bridges could be evaluated to avoid and minimize impacts to wetlands and streams. These considerations could be undertaken during development of the Final EIS and associated permit application or during more detailed phases of project development. **Table 3-18** details the estimated stream impacts for each of the Build Alternatives. Should improvements advance from the Martinsville Southern Connector Study, additional avoidance and minimization strategies may be considered including options such as locating stormwater management

features within upland areas where feasible, spanning streams with bridges, utilizing bottomless culverts or archways, providing culverts to ensure wetlands remain hydrologically connected, utilizing retaining walls to avoid wetland and WOUS. During the permitting process, stream compensation credits would be calculated using the Unified Stream Methodology. Estimated wetland mitigation credits are provided in **Table 3-19**. At this time, it is estimated that the Preferred Alternative would require five wetland credits in order to compensate for the impacts.

Table 3-18: Estimated Stream Impacts

Sub-basin (HUC 8)	Stream Type	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Upper Dan River 03010103	Ephemeral (lf)	3,485	1,218	2,176
	Intermittent (lf)	5,902	8,265	7,717
	Perennial (lf)	19,611	11,065	11,989
Total lf		**28,998**	**20,548**	**21,882**

Note: Shaded column denotes Preferred Alternative.

Table 3-19: Estimated Wetland Mitigation

Sub-basin (HUC 8)	Wetland Type (Compensation Ratio)	Alternative A		Alternative B		Alternative C (Preferred Alternative)	
		Impact Acres	Mitigation Credits	Impact Acres	Mitigation Credits	Impact Acres	Mitigation Credits
Upper Dan River 03010103	PEM (1:1)	2.3	2.3	1.3	1.3	1.0	1.0
	PSS (1.5:1)	0.8	1.2	0.7	1.1	0.2	0.3
	PFO (2:1)	3.3	6.6	2.7	5.4	1.6	3.2
	POW (0.5:1)	1.4	0.7	1.2	0.6	0.9	0.5
Total		**7.8**	**10.8**	**5.9**	**8.4**	**3.7**	**5.0**

Note: Shaded columns denote Preferred Alternative.

Unavoidable impacts to wetlands and streams would be mitigated in accordance with the 2008 final Federal regulations entitled *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (33 CFR §325 and 332; 40 CFR §230). This Final Rule, which has been adopted by both the USACE Norfolk District and the VDEQ, emphasizes a watershed approach to compensatory mitigation and presents the following preference hierarchy for compensatory mitigation (in order of preference):

1. Purchase of compensatory mitigation bank credits (mitigation banking);
2. Purchase of an approved in-lieu fee fund credits through Virginia Aquatic Resources Trust Fund (VARTF); or
3. On- or off-site mitigation by the permittee (permittee-responsible mitigation).

Within the primary service area of the alternative improvements evaluated in this Draft EIS, there are three mitigation banks that have credits available for purchasing:

- Banister Bend: approximately 2,400 stream credits; 33 wetland credits
- Graham and David: approximately 25,000 stream credits
- Roanoke River: approximately 11,000 stream credits

On September 4, 2019, USACE and EPA provided their concurrence with FHWA and VDOT that credit purchase would be the preferred method of mitigation, contingent upon the number of credits available and standard mitigation ratios at the time of construction for any improvements that advance from the Martinsville Southern Connector Study. Whether mitigation is accomplished through mitigation banks, in-lieu fee, and/or permittee-responsible mitigation, VDOT and FHWA would develop a conceptual mitigation plan for the Preferred Alternative that would be documented in the Final EIS and permit application, and refined as the design and engineering of improvements from the study advance towards construction, as necessary.

3.5.2 Floodplains

3.5.2.1 Regulatory Context and Methodology

Several Federal directives regulate construction in floodplains to ensure that consideration is given to avoidance and mitigation of adverse effects to floodplains. These Federal directives include the National Flood Insurance Act of 1968, EO 11988 (May 24, 1977), EO 13690 (January 30, 2015), and USDOT Order 5650.2, entitled *Floodplain Management and Protection*. The National Flood Insurance Act of 1968 established the National Flood Insurance Program (NFIP), which is administered by FEMA. In Virginia, the Virginia Department of Conservation and Recreation (VDCR) is responsible for coordination of all state floodplain programs. Local flood insurance programs administered by localities under the NFIP also regulate development within floodplains.

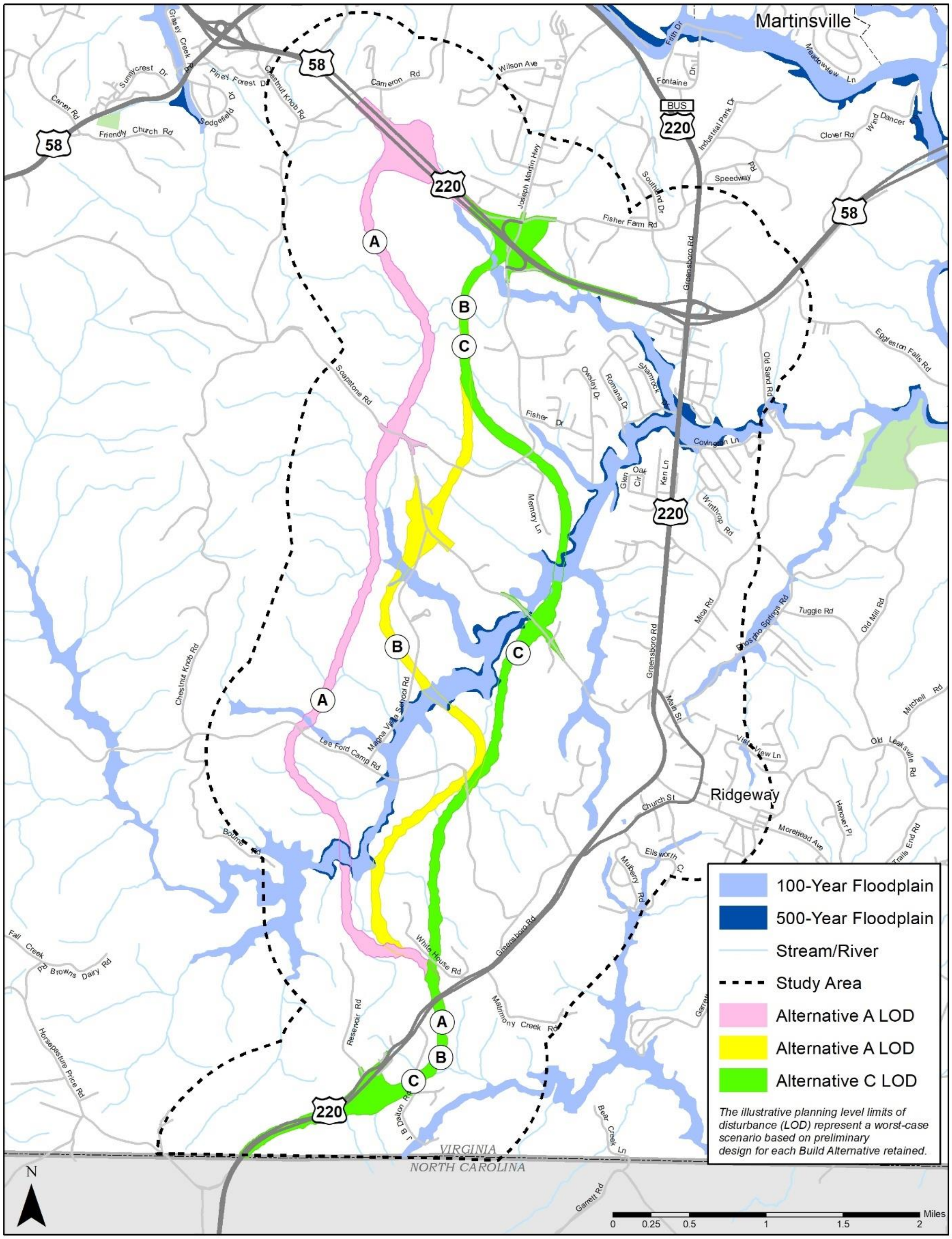
The 100-year flood, or base flood, is the area covered by a flood that has a one percent chance of occurring in any given year; this is commonly referred to as the 100-year floodplain. The 100-year floodplain includes the floodway, which is the area that encounters the deepest water and the highest velocities. The floodplain also includes the flood fringe, which is located just outside the floodway. The 500-year floodplain is the area covered by a flood that has a 0.2 percent chance of occurring in any given year.

Digital floodplain data were obtained from FEMA and overlaid in GIS to determine the acreage of 100-year and 500-year floodplains in the study area. The floodplain areas identified are land areas susceptible to being inundated by floodwaters from any source.

3.5.2.2 Affected Environment

Floodplains identified within the study area are shown in **Figure 3-12**. Within the study area, FEMA-designated 100-year floodplains occur along Little Marrowbone Creek, Marrowbone Creek, and Stillhouse Run. Five 100-year floodplains occur along Little Marrowbone Creek and Marrowbone Creek. Currently, there are six locations in the vicinity of the Alternatives Inventory Corridor where a 100-year floodplain is already impacted by an existing road. The roads that cross floodplains include Lee Ford Camp Road, Magna Vista School Road (three crossings), and Soapstone Road (two crossings).

Figure 3-12: Floodplains



3.5.2.3 Environmental Consequences

No-Build Alternative

The No-Build Alternative conditions are consistent with the existing predevelopment conditions. Existing infrastructure, development and land management has impacted floodplains (e.g. construction of roads, timber harvesting, surrounding development, etc.). The current level of impacts to floodplains would be anticipated to continue under the No-Build Alternative.

Alternative A

Alternative A would cross two 100-year floodplains associated with Marrowbone Creek and Stillhouse Run, resulting in 7.0 acres of 100-year floodplain impact (see **Table 3-20**). Additionally, approximately 8.7 acres of 500-year floodplain could be impacted.

Table 3-20: Summary of Disturbance with Floodplain*

Alternative	Total 100-year Floodplain Impact (acres)	Total 500-year Floodplain Impact (acres)
No-Build	0	0
Alternative A	7.0	8.7
Alternative B	13.7	14.4
Alternative C (Preferred Alternative)	7.5	10.8

Note: Shaded row denotes Preferred Alternative.
**In order to illustrate a worst-case scenario, impacts reported in Table 3-20 were estimated assuming no bridging. The type of bridge will be determined during more detailed phases of project development.*

Alternative B

Alternative B would cross three 100-year floodplains associated with Little Marrowbone Creek and Marrowbone Creek, resulting approximately 13.7 acres of disturbance in the 100-year floodplain (see **Table 3-20**). Additionally, 14.4 acres of 500-year floodplain could be impacted.

Alternative C (Preferred Alternative)

Alternative C would cross two 100-year floodplains associated with Little Marrowbone Creek and Marrowbone Creek, resulting in approximately 7.5 acres of disturbance in the 100-year floodplain (see **Table 3-20**). Additionally, 10.8 acres of 500-year floodplain could be impacted.

3.5.2.4 Mitigation

Regardless of the Build Alternative selected, the design for any improvements that advance from the Martinsville Southern Connector Study will be consistent with Federal policies and procedures for the location and hydraulic design of highway encroachments on floodplains contained in 23 CFR §650 Subpart A. The Build Alternatives would not, therefore, increase flood levels and would not increase the probability of flooding or the potential for property loss and hazard to life. Further, these alternatives would not be expected to have substantial effects on natural and beneficial floodplain values. Any improvements would be designed so as not to encourage, induce, allow, serve, support, or otherwise facilitate incompatible base floodplain development.

It is anticipated that the potential floodplain encroachments would not be a significant encroachment [as defined in 23 CFR §650.105(q)] because:

- It would pose no significant potential for interruption or termination of a transportation facility that is needed for emergency vehicles or that provides a community's only evacuation route;
- It would not pose significant flooding risks; and
- It would not have significant adverse impacts on natural and beneficial floodplain values.

During more detailed design, a hydrologic and hydraulic analysis would be conducted to ensure adequate design of the hydraulic openings of culverts and bridges. This would ensure proper conveyance of floodwaters to minimize potential impacts to the floodplain and floodplain hazards. The design would ensure that no substantial increase in downstream flooding would occur and/or would document the need for any Letters of Map Revision (LOMR) or Conditional Letters of Map Revision (CLOMR) and that all encroachments would conform with all applicable state and local floodplain protection standards.

3.5.3 Groundwater Resources

3.5.3.1 Regulatory Context and Methodology

The VDEQ, under the Ground Water Management Act of 1992, manages groundwater withdrawals in certain areas called Groundwater Management Areas (GWMA). As defined in 9 VAC 25-600-10, a GWMA is a geographically defined groundwater area in which the State Water Control Board has deemed the levels, supply, or quality of groundwater to be adverse to public welfare, health, and safety.

Public drinking water systems are protected by the Safe Drinking Water Act (SDWA) of 1974, as amended and reauthorized in 1986 and 1996, respectively. The SDWA also authorizes the EPA to designate sole source aquifers (SSA) and establish a review area. EPA defines a SSA as one where 1) the aquifer supplies at least 50 percent of the drinking water for its service area; and 2) there are no reasonably available alternative drinking water sources should the aquifer become contaminated. EPA has the authority to review projects that both receive Federal funding and are located within the review area.

Groundwater wells are protected under EPA's Wellhead Protection Program (WPP), a community-based approach for the protection of groundwater that supplies drinking water to public water wells and wellfields. Public drinking water systems, as defined by EPA, may be publicly or privately owned and serve at least 25 people or 15 service connections for at least 60 days per year. Wellhead protection areas are defined as the surface and subsurface areas surrounding a water well or wellfield supplying a public water system through which contaminants are reasonably likely to move toward and reach such water well or wellfield. The Virginia Wellhead Protection Plan (VDEQ, 2005) specifies a 1,000-foot wellhead protection radius and the Virginia Waterworks Regulations (VR 355-18-000) specifies a 100-foot wellhead setback zone for public groundwater supply wells.

The Virginia Department of Health (VDH) reviews projects for their proximity to public drinking water sources and provided input for this study as part of the project's scoping request. The EPA's National SSA GIS layer was used to determine the boundaries of SSAs. Nearby reservoirs were identified using VDEQ's *What's in my Backyard Online Mapper* (VDEQ, 2019a). The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

3.5.3.2 Affected Environment

The study area is located in the southern Piedmont physiographic province. Groundwater in the southern Piedmont province and study area occurs under water table conditions in secondary fractures of igneous and metamorphic rocks, overlying saprolite and residuum, and in alluvial deposits along the major surface water drainages. Groundwater is generally available in moderate quantities from shallow and deep wells but can vary greatly across the province.

Based on EPA's SSA GIS layer there are no SSAs in Henry County. Based on VDH's review for public groundwater wells, there are no public groundwater wells within the Alternative Inventory Corridors. There are four public groundwater wells located near the Alternative Inventory Corridors; however, they are over 1,000 feet away from the Build Alternatives (see **Figure 4-1** of the ***Natural Resources Technical Report*** (VDOT, 2020d)). There is a reservoir, Marrowbone Reservoir, located immediately west of Alternative A; however, it is not a drinking water supply. The reservoir was created for flood control and is privately owned (USDA, 2003).

Outside of the service areas for publicly and privately-owned licensed waterworks, residential and agricultural properties, and some public, commercial/retail, and industrial facilities rely on private wells for potable and non-potable water use. The type and construction of private wells vary depending on water demand and the site specific hydrogeologic conditions.

3.5.3.3 Environmental Consequences

Alternatives A, B, and C are outside of 1,000-foot wellhead protection radii and are not in SSAs. Therefore, no impacts to public or private groundwater supply wells are anticipated.

Due to the variability of groundwater in the province and study area, the difference in direct impacts associated with implementation of any of the Build Alternatives would be negligible. As the public groundwater wells are located over 1,000 feet away from the Inventory Corridors of Alternatives A, B, and C, the level of influence from any of these Alternatives would be anticipated to be nearly identical. Therefore, it can be assumed that any impacts resulting from the Build Alternatives would be similar.

The primary potential groundwater impact that could be anticipated from the implementation of any Build Alternative is hydrocarbon contamination of private wells in shallow and deep aquifers from automobile exhaust and asphalt surfaces. Other impacts could include potentially measurable increases in dissolved metals and chloride, increased risks of spills during construction, and contamination should pollutants be suddenly released as a result of a traffic accident. Aquifers are susceptible to contamination depending on drainage patterns, depth, and distance from the alignment.

However, VDEQ considers roadways a low risk to groundwater, according to Appendix F of the 2005 VDEQ Wellhead Protection Plan (VDEQ, 2005). It is likely that the Build Alternatives from this study would result in minimal adverse impacts to groundwater, due to the topography of the land surface. Additionally, most potable and non-potable water supply is obtained from wells between 50-150 feet deep. The depth of the wells and the aquifers would insulate them from any hydrologic or water quality changes that may occur as a result of roadway construction, normal operation, and maintenance of the road.

Any wells or septic systems that would be impacted by construction would have to be abandoned in accordance with VDH regulations.

3.5.3.4 Mitigation

During more detailed phases of project development, all private wells located in the right of way would be identified, and measures for their protection from contamination would be implemented in accordance with VDOT's *Road and Bridge Specifications*.

Measures to be evaluated by VDOT during later design phases to avoid or minimize effects to groundwater supplies include (1) pollution prevention plans implemented during critical phases of construction, and (2) design of stormwater drainage systems to prevent the infiltration of liquid contaminants or contaminated runoff. Measures that VDOT would consider to protect nearby groundwater supply wells include (1) routing runoff laden with de-icing agents away from well recharge zones, (2) stormwater management facilities developed during later design phases to optimize free ion retention through use of organic soil linings or other measures, and (3) development of Spill Prevention Control and Countermeasure (SPCC) plans. Plans would be developed in accordance with Virginia Waterworks Regulations and any wellhead protection ordinances developed by local governments and service authorities. To mitigate temporary construction impacts, an erosion and sediment control plan developed in accordance with the *Virginia Sediment and Erosion Handbook* and VDOT's *Annual Erosion and Sediment Control and Stormwater Management Standards and Specifications* (as approved by VDCR) would be implemented.

3.5.4 Wildlife Habitat

3.5.4.1 Regulatory Context and Methodology

Under the Fish & Wildlife Coordination Act (16 U.S.C. 661-667e), the Virginia Department of Game and Inland Fisheries (VDGIF) and VMRC, in combination with National Oceanic and Atmospheric Administration (NOAA) Fisheries, oversee anadromous fish in Virginia. NOAA Fisheries has jurisdiction over anadromous fish listed under the Endangered Species Act through their Office of Protected Resources. The VDGIF restricts instream work in designated anadromous fish use areas during certain times of the year. VMRC – Fisheries Management is charged with regulation of fisheries resources in tidal and marine environments.

The VDCR's Department of Natural Heritage (DNH) defines invasive species as a non-native (alien, exotic, or non-indigenous) plant, animal, or disease that causes or is likely to cause ecological and/or economic harm to the natural system (VDCR, 2019b). In accordance with EO 13112, Invasive Species, as amended, no Federal agency can authorize, fund, or carry out any action that it believes is likely to cause or promote the introduction or spread of invasive species. Other regulations governing invasive species include the Non-Indigenous Aquatic Nuisance Prevention and Control Act of 1990 (as amended), Lacey Act of 1900 (as amended), Plant Protection Act of 2000, Federal Noxious Weed Act of 1974 (as amended), and the Endangered Species Act of 1973 (as amended). Likewise, Virginia acted in 2003 to amend the Code of Virginia by adding the Nonindigenous Aquatic Nuisance Species Act, which, among other things, addresses the development of strategies to prevent the introduction of, to control, and to eradicate invasive species.

Trout streams are managed through land conservation initiatives as well as fishing laws.

Terrestrial wildlife and their habitats are managed through the United States Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. §661 et seq), the Migratory Bird Treaty Act (16 U.S.C. §703-711), conservation initiatives, and hunting laws.

VDGIF's anadromous fish GIS database was queried to determine if anadromous fish utilize streams within the Alternative Inventory Corridors. NOAA Fisheries' Essential Fish Habitat (EFH) mapper was used to determine the presence or absence of EFH within the Alternative Inventory Corridors. During field work efforts, observations of invasive plant species were noted within the Alternative Inventory Corridors. Digital cold water stream data was obtained from VDGIF and overlaid in GIS to identify mapped wild (Class I-IV) or stockable (Class V and VI) trout streams in the Alternative Inventory Corridors. Native wildlife, including migratory birds, wildlife refuges, and management areas in the study area were evaluated using data obtained from VDGIF, VDCR, USFWS, and National Marine Fisheries Service (NMFS). Additional terrestrial habitat and wildlife sources reviewed included EPA's Ecoregions, Virginia Geographic Information Network's (VGIN) Land Cover Database, and the VDCR-DNH Biotics 5 Data System. All research was supplemented by field observations in the Alternative Inventory Corridors. After going through these steps, the following resources were found not to exist in the Alternative Inventory Corridors and are not discussed further in this Draft EIS: anadromous fish use, essential fish habitat, and trout streams. These resources are documented in the ***Natural Resources Technical Report*** (VDOT, 2020d).

3.5.4.2 Affected Environment

Invasive Species

The study area is located within the Piedmont physiographic region. Some of the highly invasive plant species listed for this region, likely to occur, include tree-of-heaven (*Ailanthus altissima*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), mile-a-minute (*Persicaria perfoliata*), garlic mustard (*Alliaria petiolata*), Chinese Lespedeza (*Lespedeza cuneata*), Chinese Privet (*Ligustrum sinense*), kudzu (*Pueraria montana var. lobata.)*, Japanese stiltgrass (*Microstegium vimineum*), amur honeysuckle *(Lonicera maackii)*, and autumn olive *(Elaeagnus umbellata)*.

Observations made in the field identified areas where recent (within the last 20 years) timber harvests have occurred. It was determined Alternative Inventory Corridors A, B, and C each have tracts of land that have been logged for timber. The locations of recent timber harvesting are shown in **Figure 3-13**. Past logging activities have caused disturbance to the surrounding landscape through forest operations such as timber harvests, road and skid trail construction, landing construction, skidding of logs, and movement of machinery in and out of different operating sites which created conditions and opportunities for invasive plants to invade or spread within a site or from site to site. These forest operations have caused soil disturbance where mineral soil is exposed, which created conditions favorable for invasive plant species. These invasive species have spread due to moving equipment from one logging site to another or moving equipment that has operated in areas that have invasive plants established providing a vehicle where seeds or other plant parts can be transported into areas without invasive species.

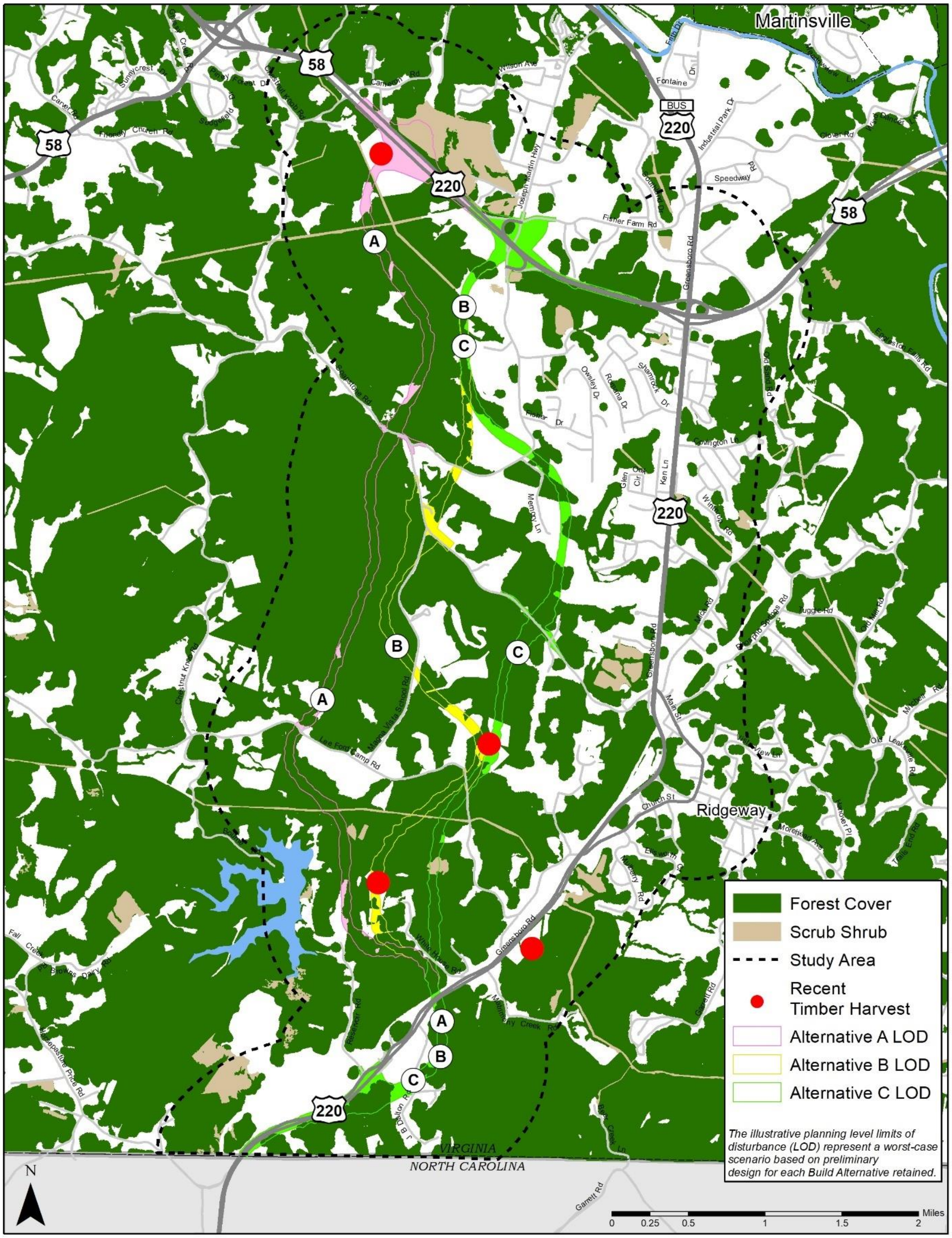
Many non-native aquatic and terrestrial animal species threaten the native plant and animal communities in Virginia by outcompeting for resources. The Virginia Administrative Code (VAC) (4VAC15-20-160) designates the following as nuisance species in Virginia, however, none of these species were directly observed during field investigations. These species include the house mouse (*Mus musculus*), Norway rat (*Rattus norvegicus*), black rat (*Rattus rattus*), coyote (*Canis latrans*), nutria (*Myocastor coypus*), woodchuck (*Marmota monax*), European starling (*Sturnus valgaris*), English sparrow (*Passer domesticus*), pigeon (*Columba livia*), and other non-native species as defined in the Migratory Bird Treaty Reform Act of 2004 and regulated under 50 Code of Federal Regulations (CFR) 10.13.

Likewise, the VDCR-DNH has identified invasive species which threaten Virginia's wildlife and plant systems such as the emerald ash borer (*Agrilus planipennis*), northern snakehead fish (*Channa argus*), rapa welk (*Rapana venosa*), and the imported fire ant (*Solenopsis invicta*). These species are listed as established in Virginia. In addition, the VDCR-DNH has also identified the Zebra mussel (*Dreissena polymorpha*), Sirex woodwasp (*Sirex noctilio* F.), rusty crayfish (*Orconectes rusticus*), and the Chinese mitten crab (*Eriocheir sinensis*) as species that may threaten Virginia's wildlife and plant systems; however, they are not well established in Virginia.

Terrestrial Habitat/Wildlife

The study area is located in Ecoregion 45e (Northern Inner Piedmont) of the EPA's Level IV Ecoregions (Woods et al. 1999). Typical topography for this area consists of dissected upland composed of hills, irregular plains, and isolated ridges and mountains (Woods et al. 1999). Rivers and drainages typically run southeastward in relatively narrow floodplains.

Figure 3-13: Forest and Scrub Shrub Habitat



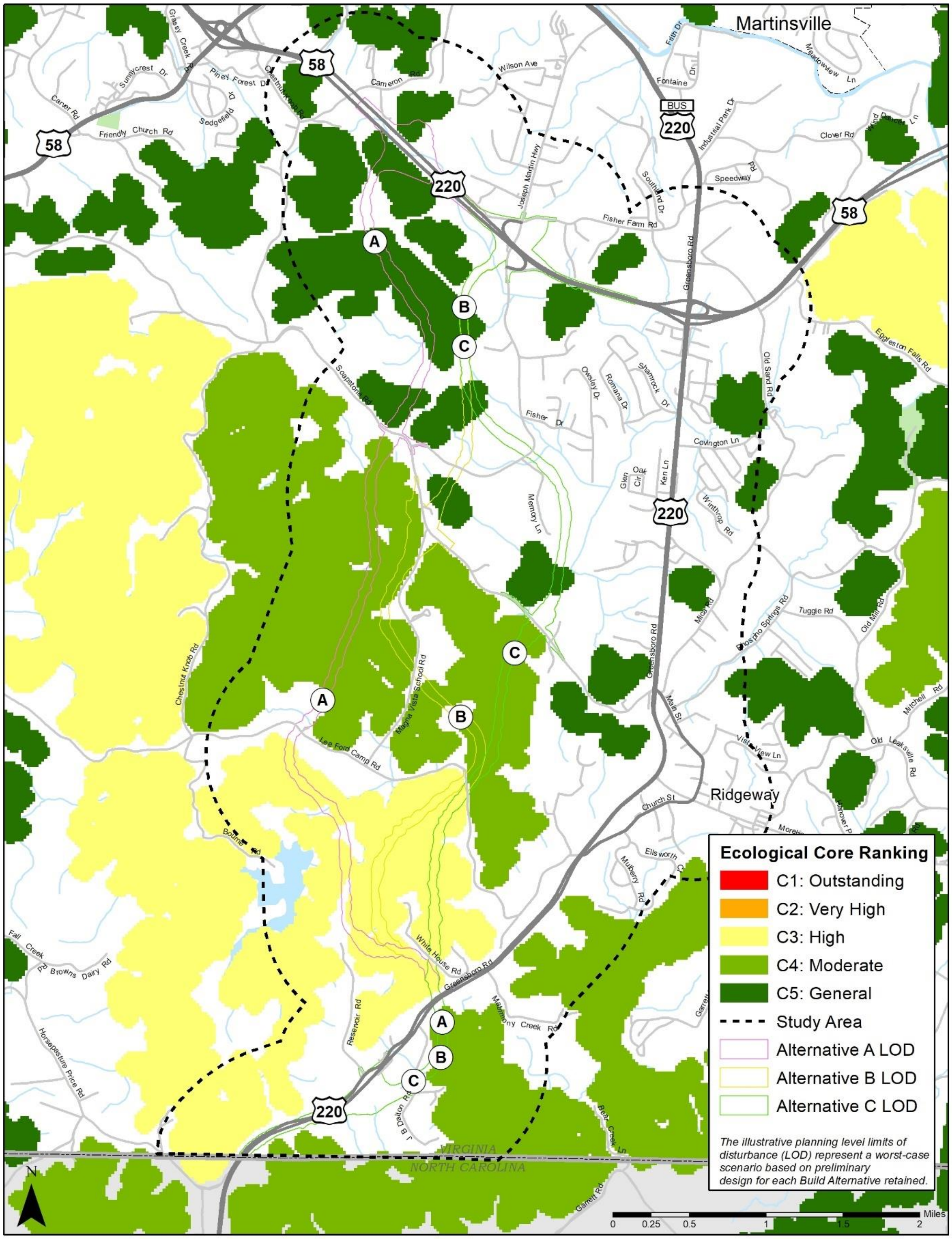
The study area has exhibited noticeable alternations over the past several hundred years, primarily due to human activity. Land development of the mid-late 20th century, including housing, agriculture, roadways, and timber harvesting have encroached into and fragmented various wildlife habitats found within the study area. Existing Route 220 is located in a north-south orientation and inhibits wildlife movement east and west. Route 58 is located in an east-west orientation and inhibits wildlife movement north and south. A majority of the residential development exists near the Route 58 and Route 220 interchange which provides impediment to wildlife passage. Rural roads, agricultural activities, and timber harvest areas fragment some of the habitat in the study area as well. Large tracts of habitat exist on the western side of the study area itself.

Based on VDCR-DNH's review of the study area and alternatives retained for evaluation, there are no natural heritage areas or conservation sites within the Alternative Inventory Corridors. VGIN's land cover dataset identifies the following land cover types within the Alternative Inventory Corridors: Open Water, Impervious, Barren, Forest, Scrub/Shrub, Harvested/Disturbed, Turf Grass, Farmland and NWI/Other. Currently, at the Route 58 interchange, there is an area of recent timber harvest. Additionally, another harvested area is regenerating (currently scrub/shrub) just north of the northern interchange with existing Route 220 and Route 58. West of Route 220, within the Alternative Inventory Corridors, the predominant land cover is Forest and Farmland. **Figure 3-13** shows the forest and scrub-shrub habitat within the Alternative Inventory Corridors. For more information on land cover, see the ***Natural Resources Technical Report*** (VDOT, 2020d).

DCR's Virginia Natural Landscape Assessment (VaNLA), a landscape-scale geospatial analysis, identifies large patches of natural land cover (habitat cores) within the Alternative Inventory Corridors. The ecological integrity of the cores in the VaNLA are ranked on a scale of one to five, with one exhibiting outstanding integrity and five exhibiting general integrity. In the area of the Alternative Inventory Corridors, VDCR's ecological core rankings are rated three (High), four (Moderate), and five (General) (see **Figure 3-14**). In general, larger, more biologically diverse areas are given lower scores. Scores are enhanced if the core is part of a larger complex of natural lands. Scores also are improved for those cores that contribute to water quality enhancement.

According to the VDGIF Fish and Wildlife Information Service (VaFWIS), a wide array of wildlife species are present within the forest lands of the study area. Large game species include the white-tailed deer (*Odocoileus virginianus*), black bear (*Ursus americanus*), and eastern wild turkey (*Meleagris allopavo*). Small game species and fur-bearing species include the gray squirrel (*Sciurus carolinensis*), raccoon (*Procyon lotor*), opossum (*Didelphis virginiana*), gray fox (*Urocyon cinereoargenteus*), and red fox (*Vulpes fulva*). Small forest-dwelling mammals are also common. These small mammals include mice, moles, and shrews. Amphibians inhabiting the forest lands of the study area include the American toad (*Bufo americanus*), upland chorus frog (*Pseudacris triseriata*), gray treefrog (*Hyla versicolor*), Cope's gray treefrog (*Hyla chrysoscelis*), northern redback salamander (*Plethodon cinereus*), northern spring salamander (*Gyrinophilus porphyriticus*), southern two-lined salamander (*Eurycea bislineata cirrigera*), white-spotted slimy salamander (*Plethodon glutinosus*), northern dusky salamander (*Desmognathus fuscus fuscus*), northern red salamander (*Pseudotriton ruber*), spotted salamander (*Ambystoma maculatum*), and Wehrle's salamander (*Plethodon wehrlei*). Reptiles inhabiting the forest lands of the study area include eastern box turtle (*Terrapene carolina*), eastern fence lizard (*Sceloporus undulatus*), five-lined skink (*Eumeces fasciatus*), northern black racer (*Coluber constrictor*), corn snake (*Elaphe guttata*), eastern garter snake (*Thamnophis sirtalis*), eastern worm snake (*Carphophis amoenus*), rough green snake (*Opheodrys aestivus*), eastern hognose snake (*Heterodon platyrhinos*), black rat snake (*Elaphe obsoleta*), northern copperhead (*Agkistrodon contortrix*), mole kingsnake (*Lampropeltis sp.*), and northern ringneck snake (*Diodophis punctatus*).

Figure 3-14: Ecological Core Rankings



Forest birds include a variety of wrens (*Troglodytidae*), warblers (*Muscicapidae*), thrushes (*Turdinae*), vireos (*Virionidae*), woodpeckers (*Picidae*), and flycatchers (*Tyrannidae*). Birds of prey inhabiting forest lands of the study area include red-tailed hawk (*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), broad-winged hawk (*Buteo platypterus*), barred owl (*Strix varia*), and great horned owl (*Bubo virginianus*). For more information on wildlife species found within the study area, see the ***Natural Resources Technical Report*** (VDOT, 2020d).

Aquatic Habitat

As described in **Section 3.5.1.1,** the construction of Alternative A, B, or C could require 70, 60, or 60 stream crossings respectively. Streams and wetlands (see **Table 3-15**) within the Alternative Inventory Corridors provide habitat for a variety of aquatic species. The LOD of Alternative A includes 55,551 lf of stream and 10.7 acres of habitat; the LOD of Alternative B includes 35,282 lf of stream and 9.0 acres of wetlands; and the LOD of Alternative C includes 36,977 lf of stream and 7.0 acres of wetlands. The streams are in relatively good health; however, there may be localized disrupting influences that are damaging to aquatic species and their habitat. Examples of disrupting influences include uncontrolled storm flows from adjacent roads which contribute to erosion and sedimentation of streams, thereby reducing habitat. For more information on water quality, refer to **Section 3.5.1.1**.

3.5.4.3 Environmental Consequences

No-Build Alternative

No construction or changes to the natural environment, other than those from previously committed projects that are currently programmed and funded in VDOT's *SYIP for FY 2020-2025* (VDOT, 2019a) and Henry County's *Budget for FY 2019-2020* (County of Henry 2019), would occur under the No-Build Alternative. Thus, project-related changes to wildlife and habitat would not occur.

Alternative A

Invasive Species

Alternative A would have a potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the LOD. The total area of disturbance for Alternative A is 492 acres. Most of that disturbance would occur within undeveloped, vegetated areas west of Route 220 that could result in the introduction of invasive species. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

Terrestrial Habitat/Wildlife

Construction of Alternative A would result in some effect to the general ecology of the roadway's surroundings (see **Table 3-21**). Alternative A would affect wildlife communities and habitat through conversion of existing land cover to paved road surfaces and maintained right of way. This alternative would fragment two large contiguous forests located to the north of Lee Ford Camp Road and continue north to the conceptual interchange of Alternative A with Route 58. In locations where this alternative bisects large forests, it would create smaller forested tracts and more edge habitat. An estimated 3.8 percent (489 acres) of the existing land cover within the study area would be converted for transportation use. This conversion would result in loss of wildlife habitat and could affect existing wildlife migration patterns as a result of the new north south road barrier, inhibiting wildlife movement east and west. This change in habitat would alter the wildlife assemblage by decreasing the number of forest-interior dwelling species and increasing the number of edge habitat species. The potential crossings of the Norfolk Southern railroad, Patterson Branch, Marrowbone Creek, and other tributaries would prevent full habitat fragmentation by providing wildlife passages.

Table 3-21: Land Cover

Land Cover Type	Total Acres within Study Area	Alternative A	Alternative B	Alternative C (Preferred Alternative)
Open Water	56.9	2.0	0.2	0.2
Developed, Open Space	1,202.3	53.8	61.2	58.7
Developed, Low Intensity	597.8	29.8	62.3	62.5
Developed, Medium Intensity	174.6	0.4	10.4	10.4
Developed, High Intensity	101.0	0.0	7.0	7.0
Barren Land	0.2	0.0	0.0	0.0
Deciduous Forest	5,816.3	257.8	163.1	133.5
Evergreen Forest	969.2	40.8	67.5	41.2
Mixed Forest	1,513.3	61.7	45.3	46.2
Grasslands/Herbaceous	587.9	22.0	10.5	9.9
Pasture/Hay	1,229.6	18.5	40.3	55.3
Cultivated Crops	29.0	0.0	0.0	0.0
Shrub/Scrub	562.6	1.8	5.0	16.0
Woody Wetlands	31.8	0.0	0.0	0.0
Emergent Herbaceous Wetlands	0.6	0.0	0.0	0.0
TOTAL	12,879	488.5	472.9	440.9

Note: Shaded column denotes Preferred Alternative.
Source: National Land Cover Dataset (2011).

Aquatic Habitat
Alternative A would impact approximately 28,998 lf of streams and 7.8 acres of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative A has the potential to carry roadway pollutants that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

Alternative B

Invasive Species
Alternative B would have the potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the LOD. The total area of disturbance for Alternative B is 480 acres. Most of that disturbance would within undeveloped, vegetated areas west of Route 220 that could result in the introduction of invasive species. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow

and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

Terrestrial Habitat/Wildlife
Alternative B would impact an estimated 3.7 percent (473 acres) of the existing land cover within the study area due to the conversion to transportation use. This alternative would fragment a large contiguous forest to the north of Lee Ford Camp Road. The alternative also impacts a large forested tract west of Magna Vista School Road; however, the alternative stays relatively close to Magna Vista School Road which is the eastern edge of the forested tract. Further north, the alternative impacts smaller forested tracts and the edges of existing forests. The potential crossings of the Norfolk Southern Railroad, Patterson Branch, Marrowbone Creek, other tributaries, and Little Marrowbone Creek would prevent full habitat fragmentation by providing wildlife passages. Alternative B direct impacts to land cover are included in **Table 3-21**.

Aquatic Habitat
Alternative B would impact approximately 20,548 lf of streams and 5.9 acres of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative B has the potential to carry roadway pollutant that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

Alternative C (Preferred Alternative)

Invasive Species
Alternative C would have a potential to affect the spread of invasive species through disturbance of natural, vegetated areas within the LOD. The total area of disturbance for Alternative C is 447 acres. Most of that disturbance would occur within undeveloped, vegetated areas west of Route 220 that could result in the introduction of invasive species. Clearing native vegetation could also aid the spread or introduction of invasive/nuisance animal species. The introduction of plant invasive species could occur from construction vehicles and equipment transporting seed. Offsite borrow and disposal areas, staging areas, and access roads could contribute similarly to the spread or introduction of these species.

Terrestrial Habitat/Wildlife
Alternative C would impact an estimated 3.4 percent (441 acres) of the existing land cover within the study area due to the conversion to transportation use. This alternative would fragment a large forest between White House Road and Lee Ford Camp Road and another between Lee Ford Camp Road and Soapstone Road. Further north, the alternative impacts smaller forested tracts and the edges of existing forests. The potential crossings of the Norfolk Southern Railroad, various tributaries, and Little Marrowbone Creek prevent full habitat fragmentation by providing wildlife passages. Alternative C direct impacts to land cover are included in **Table 3-21**.

Aquatic Habitat

Alternative C would impact approximately 21,882 lf of streams and 3.7 acres of wetlands. It would also introduce impervious surface to an otherwise undeveloped area. Consequently, stormwater runoff would also increase. The stormwater runoff associated with Alternative C has the potential to carry roadway pollutant that impact aquatic biology and habitat. Increased sedimentation could displace aquatic species due to the alternation of habitat characteristics such as converting sand, gravel, or rock substrates to silt and mud. Riparian habitat could also be reduced at the stream crossings associated with this alternative. However, the installation of stormwater BMPs would help mitigate the effect of roadway runoff pollutants on aquatic habitat by treating stormwater. BMPs would also attenuate flows, reducing the potential for downstream erosion and impacts to hydrologic regime.

3.5.4.4 Mitigation

In accordance with EO 13112, Invasive Species, the spread of invasive species would be minimized by following provisions in VDOT's *Road and Bridge Specifications*. These provisions require prompt seeding of disturbed areas with mixes that are tested in accordance with the Virginia Seed Law and VDOT's standards and specifications. Specific seed mixes that are free of noxious or invasive species may be required for environmentally sensitive areas and would be determined during the design and permitting process. In addition, in order to prevent the introduction of new invasive species and to prevent the spread of existing populations, additional BMPs could be followed, including erosion and sediment control, abatement of pollutant loading, washing machinery before it enters the area, minimizing ground disturbance, and prompt reseeding of disturbed areas. While the right of way is vulnerable to colonization by invasive plant species from adjacent properties, implementation of the stated provisions would reduce the potential for the establishment and proliferation of invasive species within highway right of way.

While each of the Build Alternatives would have the potential for impacts to terrestrial habitat and associated wildlife, coordination and concurrence with various agencies would be required through all stages of the project implementation. During design of the Preferred Alternative, the request for a CWA Section 401/404b permit would automatically initiate coordination with those agencies having jurisdiction over terrestrial wildlife and habitat, such as VDGIF and USFWS. This coordination, along with the necessary permitting, would help to avoid and minimize potential impacts to these resources through a collaborative process of determining specific mitigation such as applicable design changes and techniques and construction methods to be used during implementation.

3.5.5 Threatened and Endangered Species

3.5.5.1 Regulatory Context and Methodology

Threatened and endangered species are protected primarily by the Endangered Species Act of 1973, as amended (16 U.S.C §1531-1543 et seq. and 50 CFR §17; §402). The USFWS and NOAA - NMFS regulate and protect Federally listed threatened and endangered species under the Endangered Species Act with the primary goal of conserving and recovering listed species. The Endangered Species Act, with few exceptions, prohibits activities affecting threatened and endangered species unless authorized by a permit. The legal Federal status of a species is determined by USFWS and NMFS.

Compliance with the Endangered Species Act is required for projects that have the potential to impact Federally listed threatened or endangered species or their habitat. The Endangered Species Act, with few exceptions, prohibits, activities affecting threatened and endangered species unless authorized by a permit. Anyone who is conducting otherwise-lawful activities that will result in the incidental take of a listed wildlife species needs a permit. If a project is Federally funded, authorized, or carried out by a Federal agency, as this project is, the permitting process is conducted through Section 7 consultation. Section 7 of the Endangered Species Act request Federal agencies to consult with USFWS and/or NOAA Fisheries to ensure that any Federal Action authorized, funded, or carried out is not likely to jeopardize the continued existence of any threatened or endangered species or result in the destruction or modification of critical habitat, unless granted an exemption for such action (USFWS, 2019).

In addition to Federal oversight, threatened and endangered species are also regulated at the state level by the Virginia Endangered Species Act [Code of Virginia (COV) §29.1-563 to -570], and the Virginia Endangered Plant and Insect Species Act (COV§3.2-1000 to 3.2-1011). State agencies have adopted the Federal list as well as a state list of threatened and endangered species, with the primary focus of managing Virginia's wildlife to maintain optimum populations of all species and conserve biodiversity. The VDGIF is responsible for game, fish, and wildlife resources and habitats, and state-listed threatened, endangered, and special status animal species (exclusive of insects). The Virginia Department of Agriculture and Consumer Services (VDACS) is responsible for threatened and endangered species of plants and insects. The Virginia Department of Conservation and Recreation's Division of Natural Heritage (VDCR-DNH) maintains a statewide database for conservation planning and project review.

Under the Federal and State Endangered Species Act laws, the bald eagle (*Haliaeetus leucocephalus*) was removed from the Federal list of threatened and endangered species in 2007 and removed from the Virginia list of threatened and endangered species in 2013. However, the bald eagle still receives Federal protection under the Bald and Golden Eagle Protection Act (16 U.S.C. §668-668) and the Migratory Bird Treaty Act (16 USC §§ 703–712).

In October, 2019, the VDGIF VaFWIS database (three-mile search radius), the VDGIF Wildlife Environmental Review Map Service (WERMS) database, the USFWS Information for Planning and Consultation (IPaC) database, the VDCR-DNH online searchable database and Natural Heritage Data Explorer (NHDE) VDOT's Comprehensive Environmental Data and Reporting (CEDAR) system, the Center for Conservation Biology (CCB) Mapping Portal, and the USFWS Virginia Field Office's Bald Eagle Map Tool were queried to identify threatened and endangered species that could potentially be affected by the Build Alternatives. Additional background data were collected through aerial imagery, NRCS soils data, USGS topographic mapping, National Wetland Inventory mapping, and NHD. Further coordination with resource and regulatory agencies occurred during monthly NEPA Programs Agency Coordination meetings to identify state and Federally-listed species that need to be evaluated in this study. Additionally, threatened and endangered species database searches of both the VaFWIS database and USFWS IPaC database will be re-evaluated valid at the time of the Final EIS and JPA. USFWS has been an active participant in these coordination meetings and has provided data for this study on threatened and endangered species.

Biologists from the Virginia Polytechnic Institute and State University (Virginia Tech) – Department of Fish and Wildlife Conservation conducted habitat assessment surveys for fish and mussel habitat and are described below by species. Bat inventories were completed for all existing structures (e.g., culverts and bridges) along the Build Alternatives. Detailed data sheets and information on habitat assessments and bat inventories can be found in the ***Natural Resources Technical Report*** (VDOT, 2020d).

The Northern long-eared bat (NLEB) determination was completed on December 19, 2019 using IPaC. It was determined that the each of the Build Alternatives is consistent with the activities analyzed in the USFWS January 5, 2016, Programmatic Biological Opinion. In the absence of any response from the USFWS within 30 days of the aforementioned date, this concludes Endangered Species Act consultation responsibilities with respect to the NLEB. For more information regarding the Section 7 consultation, refer to the ***Natural Resources Technical Report*** (VDOT, 2020d).

3.5.5.2 Affected Environment

According to desktop and database research, and coordination with state and Federal agencies, a total of five potential, threatened and endangered species were identified and require evaluation for this study. No bald eagle nest sites were identified within or near the Alternative Inventory Corridors. In a response to VDOT's scoping letter, dated April 27, 2018, VDCR-DNH stated that any improvements potentially advancing from the Martinsville Southern Connector Study would not affect any documented state-listed plant or insect species.

Table 3-22 lists the species that occur on the IPAC Official Species List (per query on February 7, 2019) for the Martinsville Southern Connector Study.

Table 3-22: Threatened and Endangered Species within the Study Area

Common Name	Scientific Name	Status[1]
Roanoke logperch	*Percina rex*	FE; SE
Northern long-eared bat	*Myotis septentrionalis*	FT; ST
James Spinymussel	*Pleurobema collina*	FE; SE
Atlantic Pigtoe	*Fusconaia masoni*	Proposed FT; ST
Eastern Black Rail	*Laterallus jamaicensis*	Proposed FT
Green floater	*Lasmigona subviridis*	ST
Orangefin madtom	*Notorus gilberti*	ST

[1] FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened

<u>Roanoke Logperch</u>

The Roanoke logperch (*Percina rex*) is a freshwater fish species that is currently listed as endangered by both the USFWS and VDGIF. The Roanoke logperch is endemic to the Roanoke River and Chowan River drainage basins, where it is encountered in relatively small numbers. These watersheds encompass the southern portion of Virginia and the northern portion of North Carolina and drain towards the Albemarle Sound and the Atlantic Ocean. Populations located to date are separated from one another by long segments of rivers or by large impoundments. The Roanoke logperch inhabits medium and large rivers with warm and moderately clear waters and moderate to relatively low gradients (Jenkins and Burkhead 1994). Individuals of all life stages avoid moderately and heavily silted areas except during winter months of inactivity (Jenkins and Burkhead 1994). Populations of the Roanoke logperch are threatened by instream channelization, impoundment, and dewatering activities, and by activities within the watershed that lead to pollution and increased siltation of receiving waters.

Populations of the Roanoke logperch are reported to occur in the Smith River upstream of Martinsville (Terwilliger and Tate 1995). The USFWS, through coordination for this study, confirmed the Smith River has potential Roanoke logperch populations, although the Roanoke logperch does not appear on the IPaC Official Species List. The Smith River is also designated by VDGIF as a Threatened and Endangered Species Water, containing documented occurrences of the Roanoke logperch. As a result, Marrowbone Creek, which is a tributary to Smith River that runs through the study area and was evaluated for potential Roanoke logperch habitat.

Roanoke logperch habitat assessments were conducted within Marrowbone Creek by Virginia Tech's Department of Fish and Wildlife Conservation on May 15-17, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations are dominated by silt and sand and therefore are not suitable habitat for Roanoke logperch. The full report regarding the habitat assessments can be found in the ***Natural Resources Technical Report*** (VDOT, 2020d). Therefore, there are no documented occurrences or potential habitat for the Roanoke logperch within the Alternative Inventory Corridors.

Northern Long-Eared Bat

The NLEB (*Myotis septentrionalis*), identified on the IPaC Official Species list, is currently listed as threatened by both the USFWS and VDGIF. Home range for the NLEB is widely but patchily distributed in the eastern and north-central United States and adjacent southern Canada, and southward to southern Texas, Louisiana, Alabama, Georgia, and Florida, and westward in the United States generally to the eastern margin of the Great Plains region (VDCR, 2019c). In the winter, they hibernate in caves, mines, and tunnels with relatively constant and cool temperatures, high humidity, and no air currents. In the summer, they roost in old-growth forests with uneven forest structure, single and multiple tree-fall gaps, standing snags, and woody debris. Major threats to the species existence include wind energy development, white-nose syndrome, and habitat modification (USFWS, 2019a).

All of Henry County is within the range of the NLEB and in the White-Nose Syndrome Zone per Final 4(d) Rule from the USFWS (USFWS, 2019a). VDGIF's NLEB winter habitat and roost trees mapper indicates that there are no known hibernacula (overwintering shelters) or roost trees within 50 miles of the study area (VDGIF, 2019b). However, the surrounding mixed scrub and forest habitat still represents potential roosting habitat.

Based upon an analysis of land cover data, deciduous forest, evergreen forest, mixed forest, scrub shrub, and woody wetlands were identified as potential suitable roosting habitat for the species within the Alternative Inventory Corridors. Forested areas, easements, road edges, and waterways can provide corridors for movement between habitat areas. Trees with suitable sized cavities, buildings and bridges may provide suitable habitat for maternity roosts.

In addition to evaluating potential habitat for NLEB, a total of ten structures (bridges or major culverts) along existing roads within the Alternative Inventory Corridors were checked for signs of bat use and documented with VDOT's Bat Inventory Form. None of the structures had signs of bat use.

James Spinymussel

The James spinymussel is a freshwater mussel that is classified as endangered by the USFWS and VDGIF. The species' range includes the Upper James and Dan River Basins. The species' preferred habitat includes free-flowing streams with a variety of flow regimes and low levels of silt. The principal threats to the James spinymussel are habitat loss, degradation (e.g., increased turbidity and sewage discharge), the presence of invasive bivalves (e.g., the Asiatic clam, *Corbicula fluminea*), and agricultural runoff (USFWS, 2011).

Mussel habitat assessments were conducted within Marrowbone Creek by Virginia Tech – Department of Fish and Wildlife Conservation on May 20-21, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations contained deeply incised channels with loose, fine sand and silt with patches of fine gravel that are unsuitable for mussels. Therefore, there are no documented occurrences or potential habitat for the James spinymussel within the Alternative Inventory Corridors.

Atlantic Pigtoe

The Atlantic pigtoe is a freshwater mussel that is classified as proposed threatened by the USFWS and threatened in Virginia. Historically, this species ranged from the James and Chowan River basins in Virginia and the Roanoke, Tar, Neuse, Cape Fear, Pee Dee, and Catawba River basins in North Carolina. The species has been known to occur in the counties of Henry and Rockingham. The preferred habitat of the Atlantic pigtoe consists of coarse sand and gravel. Previously, the best populations were found in creeks and rivers with excellent water quality and silt-free substrates. Threats to this species include water quality issues caused by pollution and sedimentation as well as damming (USFWS, 2016a).

Mussel habitat assessments were conducted within Marrowbone Creek by Virginia Tech – Department of Fish and Wildlife Conservation on May 20-21, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations contained deeply incised channels with loose, fine sand and silt with patches of fine gravel that are unsuitable for mussels. Therefore, there are no documented occurrences or potential habitat for the Atlantic pigtoe within the Alternative Inventory Corridors.

Eastern Black Rail

The eastern black rail is a small, secretive marsh bird that has been declining in the eastern United States for over a century resulting in a retraction of its breeding range, an overall reduction in the number of breeding locations within its core range, and a loss of individuals within historic strongholds. Over the past 10-20 years, some reports indicate that populations have declined 75% or greater and have become dangerously low (USFWS, 2019b). Recent evidence suggests that eastern black rails may only breed in a dozen or fewer places in each state along the Atlantic and Gulf coasts (USFWS, 2019b). The eastern black rail can occur in tidally or non-tidally influenced habitat and range in salinity from salt to brackish to fresh.

As of October 9, 2018, the USFWS published a proposed rule announcing a petition finding to list the eastern black rail as a Federally threatened species. No occurrence records for the species were identified by the VaFWIS database or IPaC database at the time of the study. The USFWS has not designated critical habitat at this time and it is not determined if this study area is within the range of the eastern black rail. Through coordination with USFWS, it was determined in October 2019 that the Alternative Inventory Corridors do not intersect potential suitable habitat and would have no effect on the black rail (see **Appendix C**).

Green Floater

The green floater (*Lasmigona subviridis*), state-threatened in Virginia, is a small freshwater mussel, typically less than 5.1 centimeters (2 inches). The green floater has a trapezoidal to subovate shape and is yellow-green in color. This species mainly occurs in stagnant pools and other calm-water pockets 0.3 to 1.2 meters (1 to 4 feet) in depth. It is native to many drainage basins in the United States, including the Smith River basins. The species is typically found in clear pool habitats of streams of varying sizes with substrates of gravel and sand (VAFWIS, 2019).

Mussel habitat assessments were conducted within Marrowbone Creek by Virginia Tech – Department of Fish and Wildlife Conservation on May 20-21, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek. The results indicated that all five locations contained deeply incised channels with loose, fine sand and silt with patches of fine gravel that are unsuitable for mussels. Details can be found in the ***Natural Resources Technical Report*** (VDOT, 2020d). Therefore, there are no documented occurrences or potential habitat for the green floater within the Alternative Inventory Corridors.

Orangefin Madtom

The orangefin madtom (*Notorus gilberti*) is a freshwater fish species of the catfish family that is presently listed as threatened in Virginia. The orangefin madtom is native to the upper Roanoke River drainage basin in Virginia and North Carolina. The species occupies a narrow range of habitat in medium-sized intermontane and upper Piedmont streams (moderate to strong riffles and runs having little or no silt and moderate gradients). The orangefin madtom is an intersticine species typically found in or near cavities formed by rubble and boulders. The largest populations occupy generally clear waters (Jenkins and Burkhead, 1994). Siltation and bait-seining are threats to remaining populations of the orangefin madtom. The species is short-lived, and its apparently low reproductive potential renders the species especially vulnerable. Only five isolated indigenous populations of the orangefin madtom are known to exist in the Roanoke River drainage basin (NatureServe Explorer, 2019a).

Orangefin madtom habitat assessments were conducted within Marrowbone Creek by Virginia Tech's Department of Fish and Wildlife Conservation on May 15-17, 2019. Benthic habitat assessments were conducted at five potential crossings of the Alternative Inventory Corridors along Marrowbone Creek were completed. The results indicated that all five locations are dominated by silt and sand and therefore are not suitable habitat for orangefin madtom. Therefore, there are no documented occurrences or potential habitat for the orangefin madtom within the Alternative Inventory Corridors.

3.5.5.3 Environmental Consequences

Roanoke Logperch

There are no known occurrences of potential habitat for the Roanoke logperch within streams crossed by the Alternative Inventory Corridors. Therefore, any improvements that may advance from the Martinsville Southern Connector Study would have no effect to the Roanoke logperch.

Northern Long-Eared Bat

According to the VDGIF, NLEB Winter Habitat and Roost Trees Application, no confirmed maternity roost trees or hibernacula are located within the vicinity of the study area (VDGIF, 2019b). There were no signs of bat use within the bridges/culverts evaluated in the study area. There is potential NLEB roosting habitat within each alternative based on a review of forested and scrub shrub habitat. Potential habitat impacts are described by alternative below.

No-Build Alternative

No impacts on Federally or state listed threatened or endangered species would occur for the No-Build Alternative. Therefore, there would be no effect to this species.

Alternative A

Construction of Alternative A improvements could potentially impact approximately 318 acres of NLEB roosting habitat (**Table 3-23**). There is a relatively large tract of unfragmented forest that Alternative A impacts, which is approximately 1.7 miles long from north of Lee Ford Camp Road to Soapstone Road. However, most of the forest clearing for Alternative A would occur within fragmented areas of forested habitat interspersed by farmed land, recent timber harvest, utility corridors, and local roads (see **Figure 3-13**). Alternative A may affect the NLEB; however, any take that may occur as a result of Alternative A would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*. Additional information is included in the ***Natural Resources Technical Report*** (VDOT, 2020d) and associated appendices.

Table 3-23: Threatened and Endangered Species Potential Habitat Impacts within the Build Alternative LODs

Common Name	Alternative A (acres)	Alternative B (acres)	Alternative C – Preferred Alternative (acres)
Northern Long-Eared Bat[1]	318	261	224
Roanoke logperch	0	0	0
James spinymussel	0	0	0
Atlantic pigtoe	0	0	0
Green floater	0	0	0
Eastern black rail	0	0	0
Orangefin madtom	0	0	0

Note: Shaded column denotes Preferred Alternative.
[1] Represents acreage of suitable summer roosting habitat, based on forested and scrub shrub habitat.

Alternative B
Construction of Alternative B improvements could potentially impact approximately 261 acres of NLEB roosting habitat (**Table 3-23**). Most of the forest clearing for Alternative B would occur within fragmented areas of forested habitat interspersed by farmed land, recent timber harvest, utility corridors, and local roads (see **Figure 3-13**).). Alternative B may affect the NLEB; however, any take that may occur as a result of Alternative B would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*. Additional information is included in the ***Natural Resources Technical Report*** (VDOT, 2020d) and associated appendices.

Alternative C (Preferred Alternative)
Construction of Alternative C improvements could potentially impact approximately 224 acres of NLEB roosting habitat (**Table 3-23**). Most of the forest clearing for Alternative C would occur within fragmented areas of forested habitat interspersed by farmed land, recent timber harvest, utility corridors, and local roads (see **Figure 3-13**).). Alternative C may affect the NLEB; however, any take that may occur as a result of Alternative C would not be prohibited under the Endangered Species Act, pursuant to the January 5, 2016 *Programmatic Biological Opinion for Final 4(d) Rule on the NLEB and Activities Excepted from Take Prohibitions*. Additional information is included in the ***Natural Resources Technical Report*** (VDOT, 2020d) and associated appendices.

James Spinymussel (Federally Endangered; State Endangered)
There are no known occurrences or potential habitat for the James spinymussel within streams crossed by the Alternative Inventory Corridors. Therefore, any improvements that may advance from the Martinsville Southern Connector Study would have no effect to James spinymussel.

Atlantic Pigtoe (Proposed Listing as Federally Threatened; State Threatened)
There are no known occurrences or potential habitat for the Atlantic pigtoe within streams crossed by the Alternative Inventory Corridors. Therefore, any improvements that may advance from the Martinsville Southern Connector Study would have no effect to Atlantic pigtoe.

Eastern Black Rail
There are no known occurrences or potential habitat for the eastern black rail within the Alternative Inventory Corridors. Therefore, any improvements that may advance from the Martinsville Southern Connector Study would have no effect to eastern black rail.

Green Floater

There are no known occurrences or potential habitat for the green floater within streams crossed by the Alternative Inventory Corridors. Therefore, any improvements that may advance from the Martinsville Southern Connector Study would have no effect to the green floater.

Orangefin Madtom

There are no known occurrences or potential habitat for the orangefin madtom within streams crossed by the Alternative Inventory Corridors. Therefore, any improvements that may advance from the Martinsville Southern Connector Study would have no effect to the orangefin madtom.

3.5.5.4 Mitigation

Should any transportation improvements advance from the Martinsville Southern Connector Study, further coordination and final Section 7 effect determinations would be conducted with applicable resource agencies, including the USFWS, during the Section 404/401 permitting process.

Alternatives A, B, and C are not anticipated to affect Roanoke logperch, James spinymussel, Atlantic pigtoe, green floater, eastern black rail, or orangefin madtom. Therefore, no mitigative actions are necessary for these species.

During the design process of any Build Alternative, impacts to NLEB and clearing of vegetated habitat would be avoided and minimized. Conservation and protection measures for the NLEB would be in accordance with the final 4(d) rule and the Programmatic Biological Assessment for Transportation Projects in the Range of the Indiana Bat and Northern Long-eared Bat. Additional conservation measures may be implemented depending on the outcome of agency coordination.

3.5.6 Farmlands

3.5.6.1 Regulatory Context and Methodology

The Farmland Protection Policy Act of 1981 (FPPA) (7 USC 4201) is administered by US Department of Agriculture (USDA) NRCS and is intended to minimize the impact of Federal programs on unnecessary and irreversible conversion of farmland to nonagricultural uses. This regulation is relevant for this analysis because the potential improvements could result in impacts to farmland.

Under the FPPA, farmland is defined as:

- *Prime farmland* - land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops and is available for these uses;
- *Unique farmland* - land other than prime farmland that is used for production of specific high-value food and fiber crops; and
- *Farmland other than prime or unique* - farmland that is of statewide or local importance for the production of food, feed, fiber, forage, or oilseed crops.

Prime farmland can be cropland, pastureland, forestland, or other land, but not urban land or water. Land designated as prime farmland has the soil quality, growing season, and moisture supply to economically produce sustained high yields of crops when treated and managed according to acceptable farming methods.

The FPPA Manual was reviewed to determine if lands covered by the Act are present within the study area. Lands not covered by the Act include:

1. Lands that receive a combined score of less than 160 points from the Land Evaluation and Site Assessment criteria;
2. Lands identified as an urbanized area on U.S. Census Bureau maps;
3. Land with a tint overprint on the USGS topographical map;
4. Areas shown as white (not farmland) on USDA Important Farmland Maps;
5. Areas shown as urban-built up on USDA Important Farmland Maps;
6. Land in water storage, including lands that have been acquired or planned for water storage prior to August 5, 1984;
7. Lands that are used for national defense; and
8. Private land where no Federal funds or technical assistance is utilized.

Additional resources, such as the 2010 US Census Bureau urbanized area maps, NRCS Web Soil Survey, NRCS cropland data, and agricultural and forest districts, were also reviewed. Web Soil Survey was developed to identify land that can be used for the production of the Nation's food supply. This database classifies soils based upon their properties, qualities, and suitability for farming. Urban areas, built up areas, water areas, as well as other areas that are not suitable for farming are classified as not prime farmland. Areas with soils that are suitable and available for farming are classified as prime farmland, farmland of statewide importance, or farmland of unique importance.

3.5.6.2 Affected Environment

Statewide data provided by the Virginia Department of Forestry indicates there are no agricultural or forest districts within the Alternative Inventory Corridors. The Land Evaluation and Site Assessment criteria have been applied to each alternative through completion of Farmland Conversion Impact Rating Forms and were submitted to the USDA NRCS for review.

According to NRCS Web Soil Survey, there are 11 Prime and farmland of statewide importance soil series or named complexes within the Alternative Inventory Corridors that are subject to FPPA compliance (see the ***Natural Resources Technical Report*** (VDOT, 2020d) for more information).

There is farmland soil present within the study area and in all Alternative Inventory Corridors. Of particular interest is that almost the entire existing Route 220 and adjacent residences and commercial properties have been developed in farmland soils. Most existing development in the study area has occurred on prime farmland soils; removing those areas from potential agricultural production.

3.5.6.3 Environmental Consequences

<u>No-Build Alternative</u>

The No-Build Alternative conditions are consistent with the existing pre-development conditions. Existing infrastructure has impacted farmlands (e.g. construction of roads and development of the surrounding area). The current level of impacts to farmland would be anticipated to continue under the No-Build Alternative.

Alternative A

According to the data obtained using the NRCS cropland data layer, 30.8 acres of croplands are identified within the LOD of Alternative A. There are approximately 264 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS Farmland Conversion Impact Rating for Corridor Type Projects (FCIR) form, there are 9.71 acres of prime farmland and 258 acres of statewide and local important farmland within the Alternative A LOD. The Farmland Conversion Impact Rating is 95, and therefore, does not meet the threshold (160) for additional mitigation.

Alternative B

According to the data obtained using the NRCS cropland data layer, 38.9 acres of croplands are identified within the LOD of Alternative B. There are approximately 346 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS FCIR form, there are 66 acres of prime farmland and 336.4 acres of statewide and local important farmland within the Alternative B LOD. The Farmland Conversion Impact Rating is 99, and therefore, does not meet the threshold (160) for additional mitigation.

Alternative C (Preferred Alternative)

According to the data obtained using the NRCS cropland data layer, 53.4 acres of croplands are identified within the LOD of Alternative C. There are approximately 298 acres of prime farmland or farmland soils of statewide importance impacts in the LOD. Per the NRCS FCIR form, there are 52.7 acres of prime farmland and 302 acres of statewide and local important farmland within the Alternative C LOD. The Farmland Conversion Impact Rating is 98 and therefore, does not meet the threshold (160) for additional mitigation.

3.5.6.4 Mitigation

USDA NRCS Farmland Conversion Impact Rating forms have been completed and reviewed by USDA to determine the impact ratings to prime farmland soils and farmland soils of statewide and local importance. Per the FPPA, if USDA NRCS determines that the Alternative(s) have a Farmland Conversion Impact Rating exceeding a total score of 160, then additional mitigative actions may be required. As the Build Alternatives were determined to have impact ratings of 95, 99, and 98 respectively none of the Build Alternatives were given further consideration for protection, and thus no further action is recommended to mitigate farmland conversion.

3.5.7 Soils, Mineral Resources, and Unique Geology

3.5.7.1 Regulatory Context and Methodology

Soils, mineral resources, and unique geology are regulated through several mechanisms including the Virginia Erosion and Sediment Control Law, construction general permits, and the Surface Mining Control and Reclamation Act of 1977. These laws and regulatory mechanisms are relevant for this analysis because the potential improvements could result in impacts to soils, mineral resources, and unique geology.

Soils, mineral resources, and unique geology were assessed by reviewing available publications and digital mapping datasets. Soils data was obtained from the USDA NRCS to identify and characterize the physical properties of soil types and define their uses and vulnerability. The USDA Web Soil Survey (USDA 2019) was used to evaluate soil characteristics within the study area. Geology of the study area was reviewed to gain an understanding of the types and structures of the rocks present. Such information is important for assessing potential geologic impacts and for evaluating interrelationships between geology, surface water, and groundwater. Geology, mining, and mineral resources were evaluated from maps, publications, and data obtained from the USGS Mineral Resources Data System (MRDS) and Virginia Department of

Mines, Minerals, and Energy Online Mapping Tool. Refer to the ***Natural Resources Technical Report*** (VDOT, 2020d) for further information regarding methodology.

3.5.7.2 Affected Environment

Soils

The study area is located within the Piedmont Physiographic Province, which is dominated by igneous and metamorphic rock (William and Mary 2019). The predominant soil parent material includes gneiss, schist, and granite, of which quartz, feldspar, and mica are the dominant primary minerals. Historically, much of the Piedmont region was cleared and farmed intensively, causing extreme erosion over much of the region. Before modern soil fertility and managerial practices were adapted to these soils, agricultural production diminished, and most farms reverted back to forests (Baker 2000).

A review of the Soil Survey data indicates that there are nine soil series occurring within the study area. These include the Clifford, Codurus, Colvard, Dyke, Elsinboro, Minnieville, Orenda, Udorthents, and Woolwine series. Within these series, a total of 21 soil mapping units are present.

Eight highly erodible soils occur within the Alternative Inventory Corridors (USDA 2019). Soil Survey (USDA 2019) data identifies these soil types as having low soil strength and not being compatible with steep slopes. The ***Natural Resources Technical Report*** (VDOT, 2020d) lists and discusses highly erodible soil mapping units within the Alternative Inventory Corridors.

Mineral Resources

Mineral resources of economic importance within the study area include crushed stone for road construction and concrete, dimension stone for building construction (granite), sand, biotite gneiss, mica, schist, alumina, emery, feldspar, and iron (magnetite).

Crushed stone is, by value, the leading non-fuel mineral in Virginia, accounting for about 59 percent of the total non-fuel mineral production value. In 2008, Construction gravel and sand was the second leading non-fuel mineral, followed by Portland cement, lime, and zirconium concentrates.

Based on a review of the USGS MRDS online database, there are six listed mining sites within the Alternative Inventory Corridors (see the ***Natural Resources Technical Report*** (VDOT, 2020 d) for a list and map of mines).

Unique Geology

The Ridgeway fault is located towards the southern portion of the study area, near Ridgeway, Virginia. The Ridgeway fault has a dip to the northwest along the southeastern side of the allochthon in Henry County and is truncated against the Bowens Creek fault on the surface at the northeastern end of Chestnut Mountain in Pittsylvania County. As previous noted, the Ridgeway fault is probably truncated by the Bowens Creek fault in the subsurface beneath the Smith River allochthon in the northwestern part of Henry County and is truncated along the Chatham fault to the southeast. The Ridgeway fault zone is extensively intruded by alaskite and mica-bearing pegmatites in some areas and these intrusions have obscured the actual location of the fault line within the Ridgeway mica mining district in the southwestern part of the county (Virginia Division of Mineral Resources 1996). Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County).

3.5.7.3 Environmental Consequences

No-Build Alternative
The No-Build Alternative conditions are consistent with the existing predevelopment conditions. Existing infrastructure has impacted soils, mineral resources, and unique geology through construction of roads, harvesting timber, mining, and development of the surrounding area. The current impacts to soils would be anticipated to continue under the No-Build Alternative.

Alternative A

Soils
Construction of Alternative A would result in impacts to approximately 298 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative A. Construction of Alternative A would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

Mineral Resources
Construction of Alternative A would not impact mineral operations, as the nearby mines discussed in the ***Natural Resources Technical Report*** (VDOT 2020d) are long abandoned.

Unique Geology
Alternative A is within the Ridgeway fault at its' southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later stages of project development.

Alternative B

Soils
Construction of Alternative B would result in impacts to approximately 358 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative B. Construction of Alternative B would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

Mineral Resources
Construction of Alternative B would not impact mineral operations, as the nearby mines discussed in the ***Natural Resources Technical Report*** (VDOT 2020d) are long abandoned.

Unique Geology
Alternative B is within the Ridgeway fault at its' southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later states of project development.

Alternative C (Preferred Alternative)

Soils

Construction of Alternative C would result in impacts to approximately 343 acres of highly erodible soils. These highly erodible soil impacts are caused by land moving and grading associated with Alternative C. Construction of Alternative C would also result in soil disturbance, soil exposure and compaction that could cause potential adverse effects on shallow soil permeability, and soil erosion caused by wind and water. In addition, impervious surface would increase which could cause increased run-off volumes and thereby cause further erosion of the soils.

Mineral Resources

Construction of Alternative C would not impact mineral operations, as the nearby mines discussed in the ***Natural Resources Technical Report*** (VDOT 2020d) are long abandoned.

Unique Geology

Alternative C is within the Ridgeway fault at its' southernmost extent. Fractured, sheared, and more heavily weathered rocks are generally associated with the Ridgeway fault (trending northeast/southwest near the community of Ridgeway in southern Henry County). Due to brittle fracturing and weathering of rock types within this fault zone, slopes are relatively less stable and more erodible than similar slopes in other areas. Any geotechnical issues relating to rock types or characteristics of earth materials in the vicinity of the fault zone would be addressed as part of detailed geotechnical investigations conducted during later stages of project development.

3.5.7.4 Mitigation

Certain soil types, such as highly erodible soils, may require geotechnical analyses to identify their specific properties and to design site-specific construction techniques to ensure proper management and construction techniques are used. Soils within the construction limits would be protected by erosion and sediment controls devices during construction and then stabilized per VDEQ *Erosion and Sediment Control Handbook* (VDEQ, 2019b) and VDOT's *Road Design Manual* (VDOT, 2018b).

3.6 AIR QUALITY ANALYSIS

The alternatives retained for evaluation in the Draft EIS have been assessed for potential air quality impacts and conformity consistent with all applicable air quality regulations and requirements. All models, methods and assumptions applied in modeling and analyses were made consistent with those provided or specified in the VDOT Resource Document and associated online data repository[35]. The assessment indicates that the Build Alternatives would meet all applicable Federal air quality requirements. As such, any improvements that advance from the Martinsville Southern Connector Study would not cause or contribute to a violation of the national ambient air quality standards (NAAQS) established by the EPA.

Following is a summary of the analyses conducted for this study. Additional detailed information is provided in the ***Air Quality Technical Report*** (VDOT, 2020f).

---

[35] The Resource Document was created by VDOT to facilitate and streamline the preparation of project-level air quality analyses. It serves as a resource for modelers to help ensure that not only regulatory requirements and guidance, as appropriate, are met in all analyses but also high-quality standards for modeling and documentation are consistently achieved. In a comprehensive fashion, it addresses the models, methods, and assumptions (including data and data sources) needed for the preparation of air quality analyses for transportation projects by, or on behalf of, the Department. It includes an associated online data repository to support project-level modeling. It was subjected to inter-agency consultation with FHWA and other agencies before being finalized in 2016. It was last updated in December 2018.

3.6.1 Carbon Monoxide

As the study is located in a region that is attainment of the NAAQS for carbon monoxide (CO), only NEPA applies; EPA project-level (hot-spot) transportation conformity requirements do not apply. The conformity rule applies to projects located in “non-attainment or maintenance areas for transportation-related criteria pollutants for which the area is designated nonattainment or has a maintenance plan” [40 CFR 93.102(b)].

Analyses for potential impacts for CO were conducted for the nearby intersections that might be impacted by the Build Alternatives. Worst-case modeling assumptions, which were made consistent with the VDOT Resource Document as noted above, included:

- The studied signalized intersections for the Build Alternatives were ranked and summarized based on peak volumes and level of service (LOS). The intersections were then screened for modeling using the 2016 FHWA-VDOT *Programmatic Agreement (PA) for Project-Level Air Quality Analyses for Carbon Monoxide* (hereinafter 2016 Agreement), which references screening criteria (primarily Design-Year average daily traffic [ADT] and intersection skew angle) that were previously established based on worst-case modeling for typical intersections. The worst case intersections are skewed and were found to meet the criteria for screening for skewed intersections for all Build Alternatives that were referenced in the 2016 Agreement for 2025 and 2040 conditions, so it can be safely concluded that they would all meet the NAAQS.

For freeways, interchanges are typically the focus for CO analyses. The studied interchanges for the Build Alternatives were ranked and summarized based on peak volumes. For the interchanges that were identified as the worst-case locations, CO concentrations were estimated using EPA models (Motor Vehicle Emissions Simulator (MOVES), 2014b and CAL3QHC). A worst-case grade separation configuration was assumed that has receptors located in close proximity to the cross-over point (i.e., inside the right of way) where the highest modeled concentrations would be observed, i.e., representing worst-case placement of receptors. The results of the modeling for each of the short-listed (worst-case) interchanges indicate that, despite worst-case assumptions for traffic volumes, roadway configuration and receptor placement, the modeled worst-case CO concentrations remain well below the CO NAAQS at all receptor locations for each interchange. For purposes of NEPA, worst-case emission and dispersion modeling for CO was conducted for the worst-case interchanges for each Build Alternative. The worst-case modeling assumptions were made consistent with EPA and FHWA guidance as well as the VDOT Resource Document and included:

For emission factor modeling:

- Regional registration (age) distributions were applied that were not adjusted (as a limitation of the EPA MOVES model) for mileage accumulation rates that generally decline with age. This assumption effectively weights emission factors for older higher-emitting vehicles the same as newer lower-emitting vehicles, resulting in higher estimates for fleet-average emission factors.
- Worst-case emission factor selected as that for the maximum (or higher) road grade for each link.

For dispersion modeling:

- Traffic volumes representing level of service E conditions, which typically exceeds actual opening and design year ADT forecasts for build scenarios by substantial margins. Depending on the improvements, volumes may also be increased with the worst-case assumption of additional through lane(s) to account for auxiliary lanes or ramps.

- Worst-case receptor locations on the edge of the roadway right of way, i.e., at the closest possible point to roadway.
- Worst-case geometric assumptions that serve to concentrate traffic, emissions and concentrations to the greatest extent possible:
    - Zero vertical separation for the grade separation (interchange)
    - Zero median widths for arterial streets and minimum distance for freeways
    - Lane widths of 11 ft, compared to the standard 12 ft
- Other Federal default data for most model inputs (e.g., low wind speeds, surface roughness, and stability class), which result in higher modeled estimates of ambient concentrations than are expected to occur in practice.

Overall, the results indicate that, even with assuming worst-case traffic volumes and other modeling inputs, ambient levels of CO in the vicinity of the study area are expected to notably decline over time and to remain below both the one-hour and the eight-hour NAAQS. In general, emissions and ambient concentrations drop substantially over time (through the opening and design years) due to continued fleet turnover to vehicles constructed to more stringent emission standards. The Build Alternatives therefore are not expected to cause or contribute to a violation of the CO standards.

3.6.2 Mobile Source Air Toxics

Federal Highway Administration (FHWA) guidance (2016[36]) specifies Mobile Source Air Toxics (MSATs) to include 1,3-butadiene, acetaldehyde, acrolein, benzene, diesel particulate matter (diesel PM), ethylbenzene, formaldehyde, naphthalene, and polycyclic organic matter. Following FHWA guidance, which specifies three possible tiers of analysis and associated criteria depending on specific circumstances, this study may be categorized as one with low potential MSAT effects based on the criteria specified in FHWA guidance and the forecast traffic volumes for this study. A qualitative assessment was therefore conducted for the study, following FHWA guidance for projects with low potential impacts.

Overall, best available information indicates that, nationwide, regional levels of MSATs are expected to decrease in the future due to ongoing fleet turnover and the continued implementation of increasingly more stringent emission and fuel quality regulations. Nonetheless, technical shortcomings of emissions and dispersion models and uncertain science with respect to health effects effectively limit meaningful or reliable estimates of MSAT emissions and effects of the Build Alternatives at this time. While it is possible that localized increases in MSAT emissions may occur as a result of the Build Alternatives, emissions would likely be lower than present levels in the design year of this study as a result of EPA's national control programs that are projected to reduce annual MSAT emissions by over 80 percent between 2010 and 2050. Although local conditions may differ from these national projections in terms of fleet mix and turnover, vehicle-miles-travelled (VMT) growth rates, and local control measures, the magnitude of the EPA-projected reductions is so great (even after accounting for VMT growth) that MSAT emissions in the study area are likely to be lower in the future in nearly all cases.

[36] FHWA, *INFORMATION: Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*, October 18, 2016, p.1. See: http://www.fhwa.dot.gov/environment/air_quality/air_toxics/

3.6.3 Greenhouse Gases

With the recent withdrawal of Federal guidance addressing greenhouse gas analyses and climate change[37], the Department protocol (VDOT Resource Document, Section 4.7) for greenhouse gas (GHG) analyses was reviewed for applicability to this study. Based on the Department protocol, a GHG analysis is warranted for this study as it involves an Environmental Impact Statement. A qualitative analysis for climate change and GHGs was therefore conducted. GHG emissions from vehicles using roadways are a function of distance travelled (expressed as vehicle miles travelled, or VMT), vehicle speed, and road grade. GHG emissions are also generated during roadway construction and maintenance activities.

Under the No-Build Alternative, daily VMT would gradually increase between 2018 and 2040 as employment and population in the area increase. Similarly, under the Build Alternatives, daily VMT is expected to increase relative to the No-Build Alternative for all Build Alternatives where additional alignments would be constructed. More specific, under the No-Build Alternative, daily VMT increases approximately 32 percent between 2018 and 2040 while under the Build Alternatives, daily VMT would increase on average by approximately 44% compared to 2018 levels (the increases range from 31% to 50% depending on Alternative). Nationally, the Energy Information Administration (EIA) estimates that light-duty vehicles VMT will increase by approximately 38 percent between 2012 and 2040[38], so the VMT increase under the majority of Build Alternatives is still slightly above the projected national rate.

A major factor in mitigating this increase in VMT is EPA's GHG emissions standards, implemented in concert with national fuel economy standards. EIA projects that vehicle energy efficiency (and thus, GHG emissions) on a per-mile basis will improve by 30 percent between 2012 and 2040[39]. For example, the fuel economy of new light-duty vehicles (LDVs), measured in terms of their compliance values in Corporate Average Fuel Economy (CAFÉ) testing, rises from 32.7 miles per gallon (mpg) in 2012 to 48.2 mpg in 2040, as new fuel-saving technologies are adopted. Similarly, in 2040, passenger car fuel economy averages 55.6 mpg, and light-duty truck fuel economy averages 40.9 mpg[40]. This improvement in vehicle emissions rates will help offset the increase in VMT. Other factors related to the Build Alternatives would also help reduce GHG emissions relative to the No-Build Alternative. The Build Alternatives would improve vehicle speeds by reducing the number of curves and increasing the typical curve radius and design speed. The average travel speed across the entire study area would increase from 51.3 miles per hour under the No-Build Alternative to 51.5 to 54.1 miles per hour under the Build Alternatives. GHG emission rates decrease with speed over the range of average speeds encountered in this corridor, although they do increase at very high speeds. For example, 2040 MOVES2014b GHG emission rates at 45 mph are estimated at 1,218 grams per mile, while emission rates at 55 mph for 2040 are lower at 1,133 grams per mile. Reduction of the roadway grade also reduces energy consumption and GHG emissions; the maximum design grade for the new Route 220 roadway alternatives is four percent. The existing Route 220 roadway has a maximum grade of seven percent, which is used on the southbound roadway in Segment A. The existing approaches to the Marrowbone Creek bridge in Segment C are constructed with six percent grades. In addition, all

---

[37] See: https://www.federalregister.gov/documents/2017/04/05/2017-06770/withdrawal-of-final-guidance-for-federal-departments-and-agencies-on-consideration-of-greenhouse-gas

[38] https://www.hsdl.org/?view&did=767364. Calculated from Annual Energy Outlook 2015, Table A7. The increase in VMT is calculated from 2012 because AEO2015 does not include data for 2010

[39] https://www.eia.gov/outlooks/aeo/pdf/0383(2014).pdf

[40] https://www.eia.gov/outlooks/aeo/pdf/0383(2014).pdf (page MT-14)

other roadways and interchange ramps that are within the limits of work would have maximum design grades of five percent. Soapstone Road currently has grades of 9.5 percent near the locations of a potential interchange with Alternatives B and C, and this segment of roadway would be rebuilt at a maximum grade of five percent. EPA estimates that each one percent decrease in grade reduces energy consumption and GHG emissions by seven percent, although the effect is not linear.[41]

Other factors related to the Build Alternatives would also help reduce GHG emissions relative to the No-Build Alternative. For example, the roadway improvements and access controls under study, coupled with the reduced volumes on the existing Route 220 roadway, are anticipated to produce emissions benefits by reducing vehicle delay and idling.

The addition of new roadway miles to the study area roadway network would also increase the energy and GHG emissions associated with maintaining those new roadway miles in the future. However, the increase in construction and maintenance GHG emissions would be less compared to the operational GHG emissions associated with the new roadway. Depending on Alternative, the total roadway miles in the study area that need to be maintained on an ongoing basis would increase on average 11 percent relative to the No-Build Alternative. The increase in maintenance needs due to the addition of new roadway infrastructure would be partially offset by the reduced need for maintenance on existing routes (because of lower total traffic and truck volumes on those routes). Any increase in GHG emissions from construction activities are short term and temporary.

3.6.4 Indirect Effects and Cumulative Impacts

A qualitative assessment of the potential for indirect effects and cumulative impacts attributable to this study concluded that the potential effects or impacts are not expected to be significant given available information from the analyses conducted for CO & MSATs. The CO and MSAT qualitative assessments conducted for this study are considered indirect effects analyses because they address air quality impacts attributable to the Build Alternatives that occur at a later time in the future. Those assessments demonstrate that in the future: (1) air quality impacts from CO would not cause or contribute to violations of the CO NAAQS; and (2) MSAT emissions from the affected network would be substantially lower than they are today.

Regarding the potential for cumulative impacts, EPA's air quality designations for the region reflect, in part, the accumulated mobile source emissions from past and present actions. Since EPA has designated the region to be in attainment for all of the NAAQS, the potential for cumulative impacts associated with the Build Alternatives may reasonably be expected to not be significant. In addition, the GHG qualitative assessment conducted for the study address GHG impacts attributed to the Build Alternatives in the future. Such a discussion satisfies NEPA's requirement that agencies analyze the cumulative effects of a Federal action because the potential effects of GHG emissions are inherently a global cumulative effect. Therefore, a separate cumulative effects analysis is not required.[42]

3.6.5 Construction and Mitigation

Emissions may be produced in the construction of the Build Alternatives from heavy equipment and vehicle travel to and from the site, as well as from fugitive sources. Construction emissions

---

[41] EPA MOVES2010b model

[42] https://www.energy.gov/sites/prod/files/2019/06/f64/CEQ-Draft-GHG-Guidance-2019-06-26.pdf (p.30098, 84 FR 30097, June 26, 2019)

are short term or temporary in nature. To mitigate these emissions, all construction activities are to be performed in accordance with VDOT *Road and Bridge Specifications*[43].

VDEQ provides general comments for projects by jurisdiction. Their comments in part address mitigation "…all reasonable precautions should be taken to limit the emissions of volatile organic carbon (VOC) and nitrogen oxides (NOx). In addition, the following VDEQ air pollution regulations would be adhered to during the construction of any improvements that advance from this study: 9 VAC 5-130, Open Burning restrictions[44]; and 9 VAC 5-50, Article 1, Fugitive Dust precautions[45]."

3.6.6 Project Status in the Regional Transportation Plan and Program

The study area is located in Henry County. At the time of preparation of this technical report, the United States EPA's Green Book shows Henry County to be designated as an attainment area for all criteria pollutants.

As of the date of preparation of this analysis, the study is included in the FY *2018-2021 Statewide Transportation Improvement Program* (STIP)[46] UPC 110916 and for projects recommended in Henry County in the *2035 Long Range Transportation Plan* (LRTP)[47].

3.7 NOISE ANALYSIS

3.7.1 Regulatory Context and Methodology

FHWA regulations for the assessment and abatement of highway traffic noise in the planning and design of Federally-aided highway projects are contained in 23 CFR §772, Procedures for Abatement of Highway Traffic Noise and Construction Noise. These regulations state that a Type I traffic noise impact analysis is required when through travel lanes or interchange ramps are added. This noise analysis was conducted in accordance with FHWA noise regulations and VDOT noise policy and guidance.

To assess the degree of impact of highway traffic and noise on human activity, the FHWA established Noise Abatement Criteria (NAC) for different categories of land use activity (see **Table 3-24**). The NAC are given in terms of the hourly, A-weighted, equivalent sound level in decibels (dB(A)). The A-weighted sound level is commonly used when measuring environmental noise to provide a single number descriptor that correlates with human subjective response to noise because the sensitivity of human hearing varies with frequency. The A-weighted sound level is widely accepted by acousticians as a proper unit for describing environmental noise. Most environmental noise (and the A-weighted sound level) fluctuates from moment to moment, and it is common practice to characterize the fluctuating level by a single number called the equivalent sound level (L_{eq}). The L_{eq} is the value or level of a steady, non-fluctuating sound that represents the same sound energy as the actual time-varying sound evaluated over the same time period. For traffic noise assessment, L_{eq} is typically evaluated over a one-hour period and may be denoted as L_{eq}(h).

---

[43] See: http://www.virginiadot.org/business/const/spec-default.asp

[44] See: http://law.lis.virginia.gov/admincode/title9/agency5/chapter130/

[45] See: http://leg1.state.va.us/cgi-bin/legp504.exe?000+reg+9VAC5-50-60

[46] See: http://www.virginiadot.org/about/resources/STIP_External.pdf

[47] See
http://www.wppdc.org/content/wppdc/uploads/PDF/transportation/west_piedmont_2035_rlrp_final.pdf

Table 3-24: FHWA Noise Abatement Criteria

Activity Category	$L_{eq}(h)$[1]	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose
B[2]	67 (Exterior)	Residential
C[2]	67 (Exterior)	Active sport areas, amphitheaters, auditoriums, campgrounds, cemeteries, day care centers, hospitals, libraries, medical facilities, parks, picnic areas, places of worship, playgrounds, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, recreation areas, Section 4(f) sites, schools, television studios, trails, and trail crossings
D	52 (Interior)	Auditoriums, day care centers, hospitals, libraries, medical facilities, places of worship, public meeting rooms, public or nonprofit institutional structures, radio studios, recording studios, schools, and television studios
E[2]	72 (Exterior)	Hotels, motels, offices, restaurants/bars, and other developed lands, properties or activities not included in A-D or F
F	-	Agriculture, airports, bus yards, emergency services, industrial, logging, maintenance facilities, manufacturing, mining, rail yards, retail facilities, shipyards, utilities (water resources, water treatment, electrical), and warehousing
G	-	Undeveloped lands that are not permitted (without building permits)

[1] Hourly Equivalent A-weighted Sound Level (dB(A))
[2] Includes undeveloped lands permitted for this activity category
Source: 23 CFR §772

In this study, residential areas (Activity Category B), recreational areas (Activity Category C), and indoor institutional spaces (Activity Category D) were evaluated for noise impact. No Activity Category A sites are located within the study area. For Categories B and C, noise impact would occur when predicted exterior noise levels approach or exceed 67 dB(A) in terms of $L_{eq}(h)$ during the loudest hour of the day. For Category D, noise impact would occur where predicted interior sound levels approach or exceed 52 dB(A) $L_{eq}(h)$. VDOT defines the word approach, in approach or exceed, as within one decibel. Therefore, the threshold for noise impact is where exterior noise levels are within one decibel of 67 dB(A) $L_{eq}(h)$, or 66 dB(A), for Activity Categories B and C. Likewise, noise impact occurs when interior levels are within one decibel of 52 dB(A) $L_{eq}(h)$, or 51 dB(A), for Activity Category D. Noise impact also would occur wherever Build Alternative noise causes a substantial increase over existing noise levels. VDOT defines a substantial increase as an increase of ten decibels or more above existing noise levels for all noise-sensitive exterior activity categories.

Noise levels throughout the study area were determined for 2018 existing conditions and for the 2040 No-Build and Build Alternatives. Additional detailed information regarding the noise analysis methodology is provided in the ***Noise Analysis Technical Report*** (VDOT, 2020g).

3.7.2 Affected Environment

Both short-term (30-minute) and long-term (24-hour) noise measurements were conducted in the study corridors in March 2019 to document the existing sound levels. The existing, measured short-term noise levels are provided in **Table 3-25**. Continuous logging of events was conducted during the monitoring, so that intervals which included events that were not traffic-related could be excluded from the evaluation. For each 30-minute period, a Total L_{eq} and a Traffic-only L_{eq} (excludes those intervals that contained noise events unrelated to roadway noise) were determined. By comparing the two totals, the significance of non-traffic events (such as aircraft operations) to the overall noise level can be determined for the measurement period. The measured Total L_{eq} ranged from a low of 39 dB(A) at 705 Reservoir Road [Noise Monitoring Site (NMS)-14] to a high of 61 dB(A) at 230 Winners Circle (Site NMS-19). At 12 of the 15 sites, the values of the Traffic-only L_{eq} were the same as the measured Total L_{eq} at each measurement site, suggesting that local and distant traffic were the dominant noise sources in most parts of the study area despite the presence of other non-traffic noise sources. Those other sources of noise included aircraft overflights, power equipment, birds, dogs, distant trains, wind in the trees, and other human-related activity. The sound levels measured at the sites near major roadways were used to help validate the Traffic Noise Model (TNM) runs to be used for prediction of existing and future loudest-hour sound levels. At sites in the new location corridors away from major roadways, these existing sound levels, from the noise measurement sites, form the basis against which the predicted future Build Alternative sound levels are compared, to determine if noise impact due to substantial increases (by ten decibels) in existing noise levels is predicted.

Table 3-25: Summary of Short-Term Noise Monitoring Sites

NMS Site No.	Address or Location	Total L_{eq} (dB(A))	Traffic-only L_{eq} (dB(A))
01	11885 Greensboro Rd	51	51
02	67 Caroline Place	54	49
04	574 Church St	51	51
05	2179 Phospho Springs Road	58	58
06	393 Hen Lane	56	51
08	144 Popular St	54	54
09	1826 Lee Ford Camp Rd	48	44
10	105 Red Fox Rd	49	49
12	4355 Soapstone Rd	49	49
13	215 Ravenswood Ln	43	43
14	705 Reservoir Rd	39	39
16	701 Magna Vista School Rd	41	41
17	3591 Soapstone Rd	52	52
18	88 Watdill Circle	59	59
19	230 Winners Circle	61	61

Table 3-26 shows the range of hourly L_{eq} sound levels from two long-term noise measurement sites located along Route 220. These measurements document the existing noise levels within the study area and assist with the loudest-hour determination. The long-term noise measurement data showed that the loudest hours of the day generally occur during the morning period from 7 AM to 12 PM. The ***Noise Analysis Technical Report*** (VDOT, 2020g) provides more details of the noise measurement program and shows the locations of the measurement sites.

Table 3-26: Summary of Long-term Noise Measurements

NMS Site No.	Address or Location	Range of Hourly L_{eq} (dB(A))	Sources
03	123 Lily Road	49-58	Traffic on Route 220, railroad, birds, dogs
07	47 Wilde Street	60-69	Traffic on Route 220, birds, traffic at interchange

3.7.3 Environmental Consequences

Loudest-hour noise levels were predicted using FHWA's TNM for the existing conditions (2018) and the Design Year 2040 No-Build and Build Alternatives. Sound levels at all study area receptors were predicted explicitly from the provided traffic data for Alternatives A, B, and C. In the new location corridors away from major roadways, the existing background sound levels, as monitored, were added to the predicted build case sound levels from the future roadways to determine the total noise levels.

For all modeled receptors, the Existing Conditions (2018) noise levels are predicted to range from 37 to 67 dB(A); the No-Build Alternative (2040) noise levels are predicted to range from 37 to 67 dB(A); Alternative A (2040) noise levels are predicted to range from 46 to 67 dB(A); Alternative B (2040) noise levels are predicted to range from 45 to 66 dB(A); and Alternative C (2040) noise levels are predicted to range from 45 to 66 dB(A).

Table 3-27 presents a summary of the predicted noise impact for the 2018 existing conditions and 2040 No-Build and Build Alternatives summarized by Alternative and by FHWA land use activity categories. Most of the impacted receptors for each alternative consist of residential land uses (Category B). Of the 12 Category C (recreational) impacts under Alternative B, 11 would be due to substantial increases in existing noise levels at the Magna Vista High School athletic fields.

Table 3-27: Noise Impact Summary by Activity Category

Alternative	Scenario	Number of Impacted Units by Activity Category			
		Residences (Category B)	Recreation/ Parks (Category C)	Institutional Interior (Category D)	Total
A	2018 Existing	9	0	0	9
	2040 No-Build	14	0	0	14
	2040 Build	17	0	0	17
B	2018 Existing	11	0	0	11
	2040 No-Build	17	0	0	17
	2040 Build	24	12	0	36
C (Preferred Alternative)	2018 Existing	11	0	0	11
	2040 No-Build	17	0	0	17
	2040 Build	23	3	0	26

Note: Shaded rows denote Preferred Alternative.

Table 3-28 summarizes the total number of predicted noise impacts by alternative and by impact type. The NAC type of impact tallies the number of receptors for which the relevant NAC is predicted to be approached or exceeded, excluding receptors where a substantial increase would occur. The Substantial Increase impact type includes all exterior receptors where impact due to a substantial increase is predicted, excluding receptors with levels that approach or exceed the applicable NAC. The Both NAC and Substantial Increase type of impact shows the number of receptors where both a NAC and Substantial Increase impact is predicted to occur. Total impact indicates the total number of receptors where noise impact is predicted to occur, whether it is NAC impact or impact due to Substantial Increase.

Table 3-28: Summary of Traffic Noise Impacts by Alternative and Type of Impact

Alternative	2018 Existing	2040 No-Build	2040 Build Alternative			
	Noise Abatement Criteria (NAC)	Noise Abatement Criteria (NAC)	NAC Only (NAC)	Substantial Increase Only	Both NAC& Substantial Increase	Total
A	9	14	0	14	3	17
B	11	17	2	32	2	36
C (Preferred Alternative)	11	17	2	24	0	26

Note: Shaded rows denote Preferred Alternative.

As shown in **Table 3-28**, many of the predicted noise impacts along each respective alternative alignment are due to a substantial increase of projected noise levels over existing noise levels. Nearly all the receptors with an impact due to a substantial increase are located adjacent to future roadways on new location. The number of receptors exposed to levels that approach or exceed the relevant NAC along each respective alternative alignment would decrease as a result of the project. This is because most of the receptors exposed to levels that approach or exceed the NAC under the existing conditions or the 2040 No-Build alternative are located fairly close to existing highways – predominantly the existing Route 220. However, each Build Alternative would potentially acquire many of these impacted receptors located close to Route 220 near the southern terminus where the Build Alternatives would connect to Route 220. Other receptors that would not be acquired by the Build Alternatives would be located at relatively greater distances from existing roadways and exposed to lower levels.

3.7.4 Mitigation

When the predicted Design Year Build Alternative scenario noise levels approach or exceed the NAC during the loudest hour of the day or cause a substantial increase in existing noise, consideration of traffic noise reduction measures (described below) is warranted. If such mitigation measures would cause adverse social, economic or environmental effects that outweigh the benefits received, they may be dismissed from consideration.

3.7.4.1 Noise Abatement Measures

VDOT guidelines recommend a variety of mitigation measures that should be considered in response to transportation-related noise impacts. While noise barriers and/or earth berms are generally the most effective form of noise mitigation, additional mitigation measures exist that have the potential to provide considerable noise reductions under certain circumstances. Mitigation measures considered for this study include:

- Traffic management measures
- Alteration of horizontal and vertical alignments
- Acoustical insulation of public-use and non-profit facilities
- Acquisition of buffer land
- Construction of earth berms
- Construction of noise barriers

Traffic management measures normally considered for noise abatement include reduced speeds and truck restrictions. Reduced speeds would not be an effective noise mitigation measure alone since a substantial decrease in speed is necessary to provide a substantial noise reduction. Typically, a 10-mph reduction in speed would result in only a two dB(A) decrease in noise level, which is not considered a sufficient level of attenuation to be considered feasible. Further, a two dB(A) change in noise level is not considered to be perceptible to the human ear. Restricting truck usage on any of the Build Alternatives is not practical since one of the primary purposes of these facilities is to accommodate trucks.

A substantial alteration of the horizontal alignment of the study area corridors would be necessary to make such a measure effective in reducing noise, since a doubling of distance to the highway is usually needed to affect a five-dB(A) reduction. However, such shifts would create undesirable impacts by increasing right of way acquisitions and relocations. Alteration of the vertical alignment would have very limited benefit, given the extensive distances to most impacted properties. The substantial terrain variation throughout the study area also limits the practicality of extensive vertical alignment shifts.

Acoustical insulation of public-use and non-profit facilities applies only to public and institutional use buildings. Since no public use or institutional structures are predicted to have interior noise levels exceeding FHWA's interior NAC, this noise abatement option would not be applied.

The purchase of property for noise barrier construction or the creation of a buffer zone to reduce noise impacts is only considered for predominantly unimproved properties because the amount of property required for this option to be effective would create substantial additional impacts (e.g., in terms of residential displacements), which were determined to outweigh the benefits of land acquisition.

Berms are considered a more attractive alternative to noise walls where there is sufficient land and fill available for them. Berms would have limited application in the study corridors due to the existing terrain variation, and the increased footprint that berms would require, which would result in costly additional right of way acquisition and tree clearing. The feasibility of berms in any areas with available unimproved property adjacent to the Build Alternatives may be reevaluated during the detailed noise study during final design.

Additionally, the COV (HB 2577 as amended by HB 2025) states: "*Requires that whenever the Commonwealth Transportation Board or the Department plan for or undertake any highway construction or improvement project and such project includes or may include the requirement for the mitigation of traffic noise impacts, first consideration should be given to the use of noise reducing design and low noise pavement materials and techniques in lieu of construction of noise walls or sound barriers. Vegetative screening, such as the planting of appropriate conifers, in such a design would be utilized to act as a visual screen if visual screening is required. Consideration would be given to these measures during the final design stage, where feasible.*" The response to this requirement from project management is included in the ***Noise Analysis Technical Report*** (VDOT, 2020g).

3.7.4.2 Noise Barriers

The only remaining abatement measure for consideration is the construction of noise barriers. The feasibility of noise barriers is evaluated for locations where noise impact is predicted to occur under the Build Alternatives. Where the construction of noise barriers is found to be physically practical, barrier noise reduction is estimated based on roadway, barrier, and receptor geometry as described below.

To be constructed, any noise barriers identified in this document must satisfy VDOT's feasibility and reasonableness criteria. Therefore, the noise barrier design parameters and cost identified in this document are preliminary and should not be considered final. A final decision on the feasibility and reasonableness of noise barriers would be made during final design when the project design is developed and traffic updated. If a noise barrier is determined to be feasible and reasonable, the affected public would be given an opportunity to decide whether they are in favor of construction of the noise barrier. VDOT's formal policies for involving the public in noise abatement decisions are described in their Guidance Manual, in section 7.3.10.1 *Viewpoints of the benefited receptors*, section 12.3 *Affected Receptors/Community*, and section 12.4 *Voting Procedures*.

Feasibility and Reasonableness

FHWA and VDOT require that noise barriers be both feasible and reasonable to be recommended for construction.

To be feasible, a barrier must be effective; that is, it must reduce noise levels at noise sensitive locations by at least five dB(A), thereby benefiting the property. VDOT requires that at least 50 percent of the impacted receptors receive five decibels or more of insertion loss (noise reduction) from the evaluated barrier for it to be feasible.

A second feasibility criterion is that it must be possible to design and construct the barrier. Factors that enter into constructability include safety, barrier height, topography, drainage, utilities, maintenance of the barrier, and access to adjacent properties. VDOT has a maximum allowable height of 30 feet for noise barriers.

Barrier reasonableness is based on three factors: cost-effectiveness, ability to achieve VDOT's insertion loss design goal, and views of the benefited receptors. To be cost-effective, a barrier cannot require more than 1600 square feet per benefited receptor. VDOT's maximum barrier height of 30 feet figures into the assessment of benefited receptors. Where multi-family housing includes balconies at elevations above 30 feet, these receptors are not assessed and included in the determination of a barrier's feasibility or reasonableness.

The second reasonableness criterion is VDOT's noise reduction design goal of seven dB(A). For the barrier to be considered reasonable, this goal must be achieved for at least one of the impacted receptors, for the barrier to be considered reasonable.

The third reasonableness criterion relates to the views of the owners and residents of the potentially benefited properties. A majority of the benefited receptors must favor the barrier for it to be considered reasonable to construct. Community views would be surveyed in the detailed design phase of projects.

Potential Noise Barriers

The noise barrier analysis conducted for the Draft EIS evaluated barriers in five-foot height increments. Where barriers were evaluated in fill sections, barriers at heights from 15 feet to 30 feet (VDOT's maximum barrier height) were evaluated. For structured mounted barrier segments (on bridge or elevated structure), panel heights from ten feet to 25 feet were evaluated. This processing approach does not allow for fine-tuning of reasonableness via the surface area per benefited receptor factor with as many barrier heights as would be evaluated during the final design noise analysis. As a result, this analysis gives initial impressions of the potential cost-effectiveness of barriers for each Common Noise Environment (CNE) with each Build Alternative but cannot and should not be construed as definitive findings about the eventual reasonableness of any of the noise barriers evaluated. As mentioned earlier, all noise-sensitive areas adjacent to the Preferred Alternative would be reevaluated for noise abatement in a much more detailed manner during the detailed design phase following this NEPA environmental documentation process.

Noise barriers were evaluated for feasibility and reasonableness with TNM in 24 areas along the Build Alternative corridors where noise impact was predicted. Primarily due to the low density of homes in these rural corridors, no barriers were found to be both feasible and reasonable per VDOT's criteria. Five of the barriers were found to be not feasible, because they did not provide a five dB(A) benefit for 50 percent or more of the impacted receptors. Nineteen barriers were found to be feasible but not reasonable, because they exceeded the maximum allowable surface area (square feet) per benefit of 1,600. Details of all the noise barriers evaluated for this study are given in the ***Noise Analysis Technical Report*** (VDOT, 2020g).

3.8 HAZARDOUS MATERIALS

3.8.1 Regulatory Context and Methodology

A hazardous materials analysis was completed for the Alternative Inventory Corridors. A description of each of the Alternative Inventory Corridors and associated maps are provided in the ***Hazardous Materials Technical Report*** (VDOT, 2020e).

A database search was performed by Envirosite Corporation (Envirosite) to identify properties within and proximal to the Alternative Inventory Corridors that are listed in databases maintained by the EPA and VDEQ. All the database search distances in the Envirosite report were based on the appropriate minimum search distance requirements of the American Society for Testing and Materials (ASTM) standard. A windshield survey of each Alternative Inventory Corridor was conducted to verify location and current use of the hazardous material sites identified by the database searches. An exterior walkover of the identified hazardous material sites within and adjacent to the Alternative Inventory Corridors was also performed to confirm the location and current site conditions of facilities and properties with potential recognized environmental conditions (RECs). However, field reconnaissance of the Chesapeake Chemical Company was limited to a visual inspection from public roads because of site access limitations. Details of the database searches and results, and field-identified sites with RECs are provided in the ***Hazardous Materials Technical Report*** (VDOT, 2020e).

3.8.2 Affected Environment

Envirosite identified and mapped 13 sites with 22 hazardous materials regulatory database listings within the database one-half-mile search areas of the Inventory Corridors for Alternatives A, B, and C. The Envirosite report also identified 14 orphaned sites with 16 regulatory database listings that were unmappable because of insufficient address information. Field reconnaissance confirmed that three of the orphaned sites are linked to sites previously identified in the Envirosite database, and the remaining 11 orphaned sites were not in or adjacent to the Inventory Corridors for Alternatives A, B, or C.

No visual evidence of ongoing corrective action, remediation or additional RECs were observed during field verification and visual reconnaissance of the mappable, unmappable, and field-verified sites.

3.8.3 Environmental Consequences

3.8.3.1 No-Build Alternative

The No-Build Alternative would not result in any project related construction and would therefore not impact any hazardous materials. However, the heavy mix of local and regional truck traffic that exists today would continue and worsen in the No-Build condition.

3.8.3.2 Alternative A

There are 13 identified sites with 22 regulatory database listings within one-mile of Alternative A. As summarized in **Table 3-29**, five of these 13 REC sites have the potential to adversely impact soil and/or groundwater within the Alternative Inventory Corridor. All regulatory cases associated with spills or releases have been closed but residual contamination may remain in place. Two sites located within the Inventory Corridor reportedly have USTs closed in place that may require removal. One site located within the Inventory Corridor previously developed a remedial management plan (RMP) but was issued a No Further Remedial Action Planned (NFRAP) designation by EPA.

The remaining sites are unlikely to result in adverse impacts due to proximity to the Alternative Inventory Corridor because they are located at or greater than one-mile from the alternative or are considered to be minor environmental conditions. These identified sites may require further investigation but are not considered to be a substantial risk and should not factor into the selection of the Preferred Alternative.

Table 3-29: REC Sites Relative to Alternative A Inventory Corridor

Site	Location Relative to Inventory Corridor	REC	Potential Impacts	Contaminants of Concern
Discolored Stream,	Within Inventory Corridor	SPILLS	Soil & Groundwater	Unknown
Rohan Construction	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Ridgemart Stop & Shop	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Chesapeake Chemical Co. (Southeastern Adhesives Co.)	Within Inventory Corridor	CEDS, RMP, CERCLIS NFRAP, UST	Soil & Groundwater	Petroleum, VOCs, SVOCs, metals
ACS Chevron	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Samuel Watkins Residence	0.125 miles northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Stone's Market	0.125-miles southeast of Inventory Corridor limits	UST, LPT	Soil & Groundwater	Petroleum
Magna Vista High School	0.25-miles east of Inventory Corridor limits	UST, Archived SPILLS	Soil & Groundwater	Petroleum
Walter Thacker Residence	0.20-miles east of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Jimmie Ford Residence	0.40-miles north northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Vehicle Accident into Creek	0.50-miles east southeast of Inventory Corridor limits	LPT,	Soil & Groundwater	Petroleum
Radial, LLC, Bowles E-Bay Warehouses/Bassett-Walker Inc.	0.30-miles east of Inventory Corridor limits	UST, LPT, HIST LPT RCRA-SQG	Soil & Groundwater	Petroleum & Chromium
Bassett-Walker Inc. (Distribution Center	0.80-miles east of Inventory Corridor limits	UST, LPT	Soil & Groundwater	Petroleum

3.8.3.3 Alternative B

There are 13 identified sites with 22 regulatory database listings within one-mile of Alternative B. As summarized in **Table 3-30**, eight of the 13 REC sites have the potential to adversely affect soil and/or groundwater within the Inventory Corridor. All regulatory cases associated with spills or releases have been closed but residual contamination may remain in place. Two sites located within the Inventory Corridor reportedly have USTs closed in place that may require removal. One site located within the Inventory Corridor previously developed a RMP but was issued a NFRAP designation by EPA.

The remaining sites are considered unlikely to result in adverse impacts due to proximity to the Alternative Inventory Corridor or are considered to be minor environmental conditions. These identified sites may require further investigation but are not considered to be a substantial risk and should not factor into the selection of the Preferred Alternative.

Table 3-30: REC Sites Relative to Alternative B Inventory Corridor

Site	Location Relative to Inventory Corridor	REC	Potential Impacts	Contaminants of Concern
Rohan Construction	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Ridgemart Stop & Shop	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Chesapeake Chemical Co. (Southeastern Adhesives Co.)	Within Inventory Corridor	CEDS, RMP, CERCLIS NFRAP, UST	Soil & Groundwater	Petroleum, VOCs, SVOCs, metals
ACS Chevron	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Stone's Market	Within Inventory Corridor	UST, LPT	Soil & Groundwater	Petroleum
Vehicle Accident into Creek	Within Inventory Corridor	LPT,	Soil & Groundwater	Petroleum
Bassett-Walker Inc. (Distribution Center	Within Inventory Corridor	UST, LPT	Soil & Groundwater	Petroleum
Discolored Stream,	Within Inventory Corridor	SPILLS	Soil & Groundwater	Unknown
Samuel Watkins Residence	0.125 miles north/northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Radial, LLC, Bowles E-Bay Warehouses/Bassett-Walker Inc.	0.30-miles east of Inventory Corridor limits	UST, LPT, HIST LPT RCRA-SQG	Soil & Groundwater	Petroleum & Chromium
Magna Vista High School	0.097-miles east of Inventory Corridor limits	UST, Archived SPILLS	Soil & Groundwater	Petroleum
Jimmie Ford Residence	0.295-miles north northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Walter Thacker Residence	0.21-miles northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum

3.8.3.4 Alternative C (Preferred Alternative)

There are 13 identified sites with 22 regulatory database listings within one-mile of Alternative C. As summarized in **Table 3-31**, eight of the 13 REC sites have the potential to adversely affect soil and/or groundwater within the Inventory Corridor. All regulatory cases associated with spills or releases have been closed but residual contamination may remain in place. Two sites located within the Inventory Corridor reportedly have USTs closed in place that may require removal. One site located within the Inventory Corridor previously developed a RMP but was issued a NFRAP designation by EPA.

The remaining sites are considered unlikely to result in adverse impacts due to proximity to the Alternative Inventory Corridor or are considered to be minor environmental conditions. These identified sites may require further investigation but are not considered to be a substantial risk and should not factor into the selection of the Preferred Alternative.

Table 3-31: REC Sites Relative to Alternative C (Preferred Alternative) Inventory Corridor

Site	Location Relative to Inventory Corridor	REC	Potential Impacts	Contaminants of Concern
Bassett-Walker, Inc. (Distribution Center)	Within Inventory Corridor	UST, LPT	Soil & Groundwater	Petroleum
Rohan Construction	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Ridgemart Stop & Shop	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Chesapeake Chemical Co. (Southeastern Adhesives Co.)	Within Inventory Corridor	CEDS, RMP, CERCLIS NFRAP, UST	Soil & Groundwater	Petroleum, VOCs, SVOCs, metals
ACS Chevron	Within Inventory Corridor	UST	Soil & Groundwater	Petroleum
Stone's Market	Within Inventory Corridor	UST, LPT	Soil & Groundwater	Petroleum
Vehicle Accident into Creek	Within Inventory Corridor	LPT,	Soil & Groundwater	Petroleum
Discolored Stream,	Within Inventory Corridor	SPILLS	Soil & Groundwater	Unknown
Samuel Watkins Residence	0.125 miles north/northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Radial, LLC, Bowles E-Bay Warehouses/Bassett-Walker Inc.	0.30-miles east of Inventory Corridor limits	UST, LPT, HIST LPT RCRA-SQG	Soil & Groundwater	Petroleum & Chromium
Walter Thacker Residence	0.20-miles northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Jimmie Ford Residence	0.295-miles north northeast of Inventory Corridor limits	LPT	Soil & Groundwater	Petroleum
Magna Vista High School	0.80-miles west of Inventory Corridor limits	UST, Archived SPILLS	Soil & Groundwater	Petroleum

3.8.4 Mitigation

Further evaluation of sites associated with the Preferred Alternative with identified potential RECs is recommended prior to right of way acquisition and/or earth disturbing activities to provide additional information about site conditions. Specifically, prior to right of way acquisition, a Phase I ESA, conducted consistent with the ASTM method E1527-13, is recommended to determine the potential presence of RECs including hazardous materials and/or onsite contamination within or in close proximity to the Preferred Alternative Inventory Corridor that could adversely impact soil and groundwater. Based on the Phase I ESA findings, additional studies/investigations, including Phase II ESAs or limited subsurface investigations, following ASTM method E1903-11, may be recommended to confirm the presence/absence of contamination and evaluate sites within or in close proximity to the Preferred Alternative Inventory Corridor where earth disturbance is anticipated.

If impacted soil and/or groundwater is identified during investigations, standard mitigation/ remediation measures are recommended, including excavation and treatment/disposal of soil and/or groundwater. Mitigation measures shall be developed, approved and implemented prior to construction and should include developing a contaminated materials management plan to address worker safety, handling, on-site storage/management, reuse, disposal and/or treatment. The contaminated materials management plan shall be developed in accordance with Federal, state and local regulations and should include the characterization of soil and a management procedures plan developed in accordance with 9 VAC 20-60 and 9VAC20-81 prior to reuse or off-site disposal. Efforts requiring tank closures or site remediation shall be coordinated with VDEQ.

3.9 VISUAL RESOURCES

3.9.1 Regulatory Context and Methodology

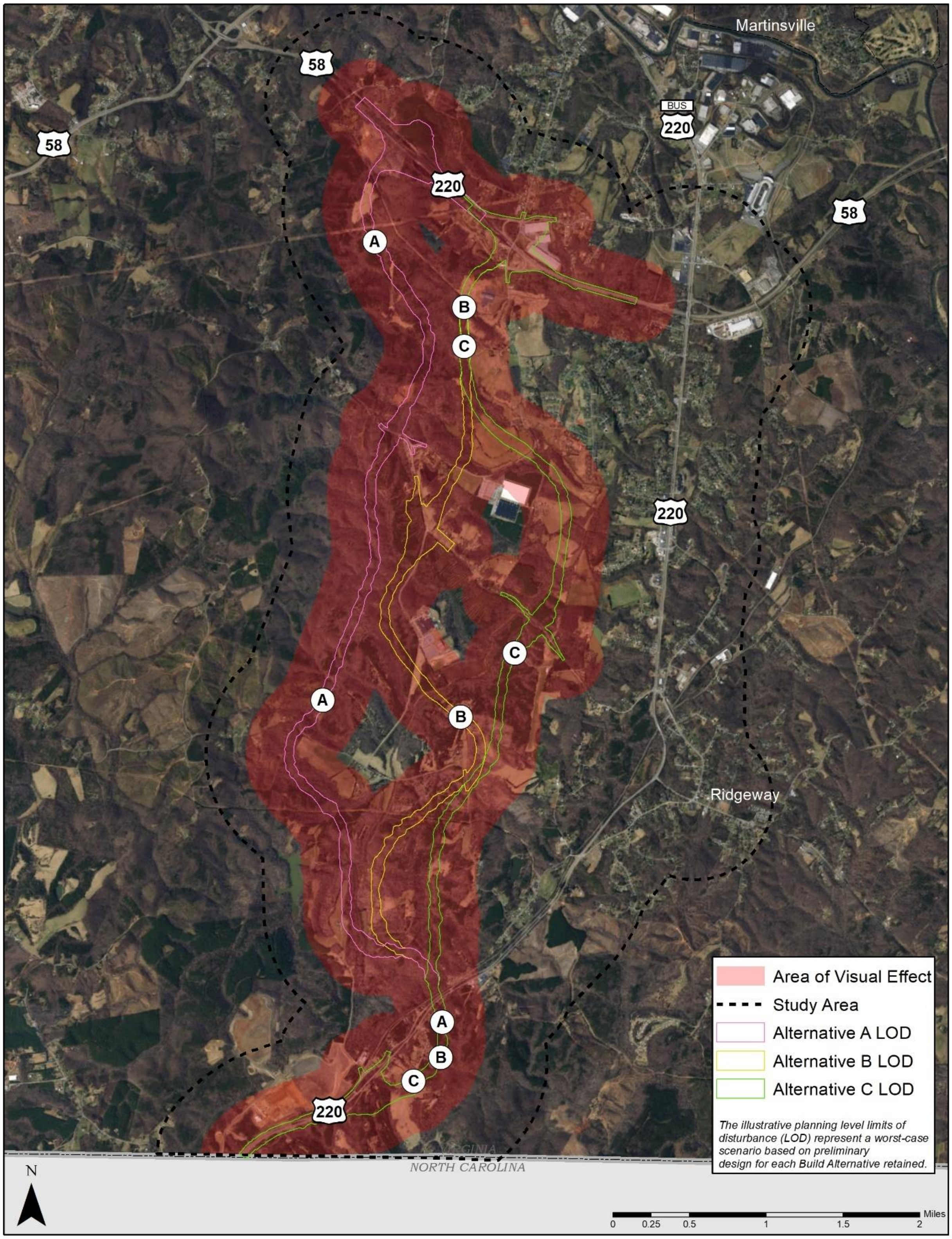
The assessment of potential visual impacts is consistent with FHWA's *Visual Impact Assessment for Highway Projects* (FHWA, 2015) and FHWA Technical Advisory T6640.8A (FHWA, 1987). These guidance documents indicate that a person's visual experience is based upon physical features that comprise the surrounding landscape, such as vegetation, water, land, or other man-made structures. The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

Site visits, review of satellite imagery and GIS data were conducted to identify the potential effects of the alternatives retained for evaluation on the surrounding viewshed. Views of what residents see and views of what drivers see were both considered in determining the Area of Visual Effect (AVE).

Because the alternatives are primarily within rural areas with rolling topography and land use characterized by uninhabited and forested areas, the AVE to assess impacts to visual resources was determined to extend 0.25 miles from the LOD for each alternative (see **Figure 3-15**).

The visual impact of the alternatives has been determined by assessing the change in visual resources due to the alternatives and predicting viewer response to that change. The magnitude of impacts to the visual resources within the AVE from specific vantage points is described as minor, moderate or major. Minor impacts would be those which are not detectable, slightly detectable, or localized within a relatively small area. Moderate impacts would be those that are readily apparent but do not contribute to a change in the character of the landscape. Major impacts would be substantial, highly noticeable, and/or result in changing the character of the landscape.

Figure 3-15: Area of Visual Effect



3.9.2 Affected Environment

The AVE encompasses primarily open space, as well as areas of residential and agricultural use. The primary area that would be disturbed by the Build Alternatives is forested land. The topography is rolling, which constricts views in the valleys and expand views on the hillsides; however, because of the extensive forest cover, views are relatively confined. The views of drivers along Lee Ford Camp Road are restricted by the winding path of the roadway and the trees and vegetation adjacent to the road. Views along Lee Ford Camp Road are further blocked in a few locations where the road cuts through hills. West of the intersection with Magna Vista School Road, Lee Ford Camp Road transitions to an unmarked paved road, from which the views are comprised of a mix of agricultural fields, woodland, and a small number of private residences. The views from Soapstone Road through the AVE are limited, as trees line the majority of the road, though open fields and private residences are more present along the road near the western reaches of the AVE. The views along Joseph Martin Highway, another local road that travels through the AVE, are constrained by the rolling topography of the area, with a few open fields, private properties, and businesses present along the road.

Along Route 220 within the AVE, the viewshed is characterized by forested lands and traffic along the roadway. Today, near the state line, the views to the west of Route 220 are characterized by large swaths of the cleared but undeveloped land that comprises the Commonwealth Crossing Business Centre. The east side of this southern portion of the AVE is abutted by a dense tree line broken up by occasional driveways and private residences. As the Alternative Inventory Corridors for Alternatives A, B, and C swing east of Route 220, the AVE is characterized primarily by densely forested lands with several residential properties interrupting the landscape. Moving north, the AVE is defined by forested land, with intermittent clearings and private properties sporadically situated in this rural area. Marrowbone Reservoir, Magna Vista High School, and Pace Airport are all within the AVE south of Soapstone Road. Local intermodal facilities, DDI and Radial, as well as Mercy Crossing church, are within the AVE north of Soapstone Road. At the northern end of Alternative A, the predominant feature of the AVE is densely forested land with Route 58 cutting abruptly through the trees. To the east, at the northern end of Alternatives A and B, there are far more clearings and residential properties scattered along Route 58. Near the Route 58, views are dominated by transportation infrastructure, commercial and industrial properties, and residences.

Five historic resources are located within the AVE. The status of these two resources in the National Register of Historic Places (eligible and listed, respectively) renders these properties visually sensitive. Visual impacts to historic properties are assessed under Section 106 of the National Historic Preservation Act reported in the ***Phase I A Archaeological Survey*** (VDOT, 2020h).

3.9.3 Environmental Consequences

3.9.3.1 No-Build Alternative

With the No-Build Alternative, the visual landscape along the Route 220 corridor would continue to primarily feature vehicular traffic, which is projected to increase in volume in the future. Views along Route 220 today would become even more characterized by the increased amounts of cars and trucks. The views of travelers along Route 220 would also become progressively comprised of this traffic and less of the surrounding visual environment.

3.9.3.2 Alternative A

Alternative A would have limited visual impacts along the Route 220 mainline. Drivers along existing Route 220 may also be more visually aware of their surroundings, which would be less dominated by traffic. At the southern end of the AVE, near the state line, Alternative A would have a moderate impact of the viewshed of travelers along Route 220 and a major impact to the viewshed of the residents of the several properties in the J.B. Dalton neighborhood to the east of

Route 220. Where the viewshed of residents along the Alternative A alignment is currently a combination of open space and forested lands, this alternative would introduce new visual elements of transportation infrastructure and traffic. These visual changes would be more perceivable to residents immediately adjacent to the new infrastructure. Sensitivity may be less for other viewers in the AVE where forested areas or distance from the new roadway infrastructure would make these changes less noticeable. Impacts to the views near the potential interchange at Soapstone Road and throughout the alignment of Alternative A would be moderate, as the facility would introduce transportation infrastructure and traffic currently unseen on the smaller local roads in use today and may disrupt the heavily forested landscape in some areas. In other areas, there would be negligible or minor impacts to the viewshed, as the topography is rolling and covered in so much forest that local residents would not be visually aware of the intrusion. The view of the drivers on the alignment of Alternative A would be similar to what drivers currently experience on the smaller local roads, but on a more modern roadway. The visual environment around the new or modified interchanges, implemented as part of this alternative, would potentially resemble an area on the existing Route 220 corridor. The intersection at Route 220 and Water Plant Road is a unique visual setting that exemplifies how the area around the new and modified interchanges may appear. This area on the corridor is unique in that its two service stations serve as an active hub for truck traffic traveling through the corridor. The viewshed of the Marrowbone Reservoir would also be impacted by this alternative. At the northern end of Alternative A, the visual impacts would be minor as the existing Route 58 facility impacts the viewshed of travelers and residents through the AVE today.

3.9.3.3 Alternative B

Alternative B would have limited visual impacts along the Route 220 mainline. Drivers along existing Route 220 may also be more visually aware of their surroundings, which would be less dominated by traffic. At the southern end of the AVE, near the state line, Alternative B would have a moderate impact of the viewshed of travelers along Route 220 and a major impact to the viewshed of the residents of the several properties in the J.B. Dalton neighborhood to the east of Route 220. Where the viewshed of residents along the Alternative B alignment is currently a combination of open space and forested lands, this alternative would introduce new visual elements of transportation infrastructure and traffic. These visual changes would be more perceivable to residents immediately adjacent to the new infrastructure. Sensitivity may be less for other viewers in the AVE where forested areas or distance from the new roadway infrastructure would make these changes less noticeable. Impacts to the views near the potential interchange at Soapstone Road and throughout the alignment of Alternative B would be moderate, as the facility would introduce transportation infrastructure and traffic currently unseen on the smaller local roads in use today and may disrupt the forested landscape in some areas. In other areas, there would be negligible or minor impacts to the viewshed, as the topography is rolling and forested such that local residents may not be visually aware of the intrusion. The view of the drivers on the alignment of Alternative B would be similar to what drivers currently experience on the smaller local roads, but on a more modern roadway. The visual environment around the new or modified interchanges, implemented as part of this alternative, would potentially resemble an area on the existing Route 220 corridor. The intersection at Route 220 and Water Plant Road is a unique visual setting that exemplifies how the area around the new and modified interchanges may appear. This area on the corridor is unique in that its two service stations serve as an active hub for truck traffic traveling through the corridor. North of the potential interchange at Soapstone Road, impacts to the viewshed would be minor, as well-traveled roads and several homes, community institutions, and business are present in the AVE. Alternative B would potentially directly impact the viewshed of many properties north of Route 58; including homes adjacent to Joseph Martin Highway, those adjacent to Fisher Farm Road, and those adjacent to Trinity Terrace. This alternative may also impact the viewshed of the Mercy Crossing Church.

3.9.3.4 Alternative C (Preferred Alternative)

Alternative C would have limited visual impacts along the Route 220 mainline. Drivers along existing Route 220 may also be more visually aware of their surroundings, which would be less dominated by traffic. At the southern end of the AVE, near the state line, Alternative B would have a moderate impact of the viewshed of travelers along Route 220 and a major impact to the viewshed of the residents of the several properties in the J.B. Dalton neighborhood to the east of Route 220. Where the viewshed of residents along the Alternative C alignment is currently a combination of open space and forested lands, this alternative would introduce new visual elements of transportation infrastructure and traffic. These visual changes would be more perceivable to residents immediately adjacent to the new infrastructure. Sensitivity may be less for other viewers in the AVE where forested areas or distance from the new roadway infrastructure would make these changes less noticeable. Impacts to the views near the potential interchange at Soapstone Road and throughout the alignment of Alternative C would be moderate, as the facility would introduce transportation infrastructure and traffic currently unseen on the smaller local roads in use today and may disrupt the landscape in some areas. In other areas, there would be negligible or minor impacts to the viewshed, as this alternative would follow through a valley and forested area such that local residents would not be visually aware of the intrusion. The view of the drivers on the alignment of Alternative C would be similar to what drivers currently experience on the smaller local roads, but on a more modern roadway. The visual environment around the new or modified interchanges, implemented as part of this alternative, would potentially resemble an area on the existing Route 220 corridor. The intersection at Route 220 and Water Plant Road is a unique visual setting that exemplifies how the area around the new and modified interchanges may appear. This area on the corridor is unique in that its two service stations serve as an active hub for truck traffic traveling through the corridor. North of the potential interchange at Soapstone Road, impacts to the viewshed would be minor, as well-traveled roads and several homes, community institutions, and business are present in the AVE. Alternative C would potentially directly impact the viewshed of many properties north of Route 58; including homes adjacent to Joseph Martin Highway, those adjacent to Fisher Farm Road, and those adjacent to Trinity Terrace. This alternative may also impact the viewshed of the Mercy Crossing Church.

3.9.4 Mitigation

Measures to minimize or mitigate visual quality effects often include landscaping and modifications to enhance the aesthetics of topography, structure, and lighting design. Should the study advance to more detailed phases of project development, VDOT would consider approaches that would address concerns of highly sensitive viewsheds.

3.10 ENERGY REQUIREMENTS AND CONSERVATION POTENTIAL

3.10.1 Regulatory Context and Methodology

Consideration of energy consumption and conservation potential of alternatives and mitigation measures in EIS documents is required by the Council on Environmental Quality (CEQ) guidance at 40 Code of Federal Regulations (CFR) §1502.16(e) and FHWA technical guidance (TA 6640.8A). The Environmental Analysis Methodologies were prepared and distributed to the Cooperating and Participating Agencies in May 2018, revisions were made to address the agencies' comments, and the methodologies were concurred upon following the June 18, 2018 agency meeting (see **Section 6.2: Agency Coordination** for additional information).

This evaluation includes a qualitative comparison of energy consumption associated with the construction and maintenance of the evaluated alternatives and vehicle operation on the affected roadway network. Transportation energy use is categorized as direct or indirect use (FHWA TA 6640.8A). Direct energy use is related to the amount of fuel consumed for vehicle propulsion on the affected roadway. Energy use from vehicle operation is primarily a function of traffic volume, speed, distance traveled, and vehicle and fuel type. Roadway congestion affects travel speeds that impacts fuel consumption, resulting in slower speeds and increased idling that can increase energy consumption.

Indirect energy is energy consumed during construction of a transportation facility that is a function of the scale of the transportation infrastructure being constructed. Accurate construction energy costs cannot be determined given the uncertainty of field variables at this point in the study. However, construction energy factors include the amount of energy to extract raw materials, manufacture and fabricate construction materials, transport materials to the Alternative Inventory Corridors, and equipment operation to complete construction. In addition, temporary vehicle delays could occur resulting in additional energy usage and fuel consumption of commuter vehicles. More energy usage would also be incurred due to maintenance of the expanded facilities.

3.10.2 Affected Environment

In the United States, the transportation sector is the second largest consumer of energy behind the industrial sector. The transportation sector comprises approximately 27 percent of end-use energy consumption in the country (EIA, 2013). Within Virginia, the transportation sector is the largest consumer of energy, accounting for approximately 30 percent of end-use energy consumption (EIA, 2013). Of this consumption, motor gasoline makes up the second largest source of consumption, next to net interstate flow of electricity (EIA, 2013). Approximately three-fifths of the petroleum used in Virginia is consumed as motor gasoline (EIA, 2018).

3.10.3 Environmental Consequences

3.10.3.1 No-Build Alternative

Increased idling, stop-and-go conditions and traveling at reduced speeds can cause increased fuel consumption. This is occurring on Route 220 today as the local and regional traffic mix with many signalized intersections. During events involving accidents and disabled vehicles, diverting to alternate routes also results in additional fuel consumption to travelers due to extra travel distances. These conditions are anticipated to continue under the No-Build Alternative.

The No-Build Alternative involves no project-related construction and would therefore have no indirect energy consumption impact.

3.10.3.2 Alternative A

Alternative A spans approximately 8.3 miles. Construction energy would be used to build the mainline roadway, interchanges, structures, and bridges. Because construction is a one-time occurrence and temporary, no long-term impacts to energy consumption would occur.

Alternative A would provide a new roadway with the potential for increased capacity and increased fuel consumption. However, this would be offset by reducing vehicle idling and stop-and-go conditions on Route 220 – thereby reducing energy consumption from the existing condition.

3.10.3.3 Alternative B

Alternative B spans approximately 7.7 miles. Construction energy would be used to build the mainline roadway, interchanges, structures, and bridges. Because construction is a one-time occurrence and temporary, no long-term impacts to energy consumption would occur.

Alternative B would provide a new roadway with the potential for increased capacity and increased fuel consumption. However, this would be offset by reducing vehicle idling and stop-and-go conditions on Route 220 – thereby reducing energy consumption from the existing condition.

3.10.3.4 Alternative C (Preferred Alternative)

Alternative C spans approximately 7.4 miles. Construction energy would be used to build the mainline roadway, interchanges, structures, and bridges. Because construction is a one-time occurrence and temporary, no long-term impacts to energy consumption would occur.

Alternative C would provide a new roadway with the potential for increased capacity and increased fuel consumption. However, this would be offset by reducing vehicle idling and stop-and-go conditions on Route 220 – thereby reducing energy consumption from the existing condition.

3.10.4 Mitigation

Measures to mitigate the energy usage during construction may include limiting the idling of machinery and optimizing construction methods to lower overall fuel use. Additionally, future vehicular energy consumption is expected to be reduced in part by improvements to vehicle energy efficiency. Over time, older and less fuel-efficient vehicles are expected to be replaced with more fuel-efficient vehicles, including hybrid and electric vehicles.

3.11 CHILDREN'S HEALTH AND SAFETY

An assessment of children's health has been performed in accordance with EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, which directs Federal agencies to identify and assess environmental health and safety risks that may disproportionately affect children. Impacts to children have been considered separately in this Draft EIS because children may experience a different intensity of impact, as compared to an adult exposed to the same event. The most likely locations of potential effects on children, in addition to residences, would be at schools where there are outdoor activity areas for children. There are two schools, Drewry Mason Elementary School and Magna Vista High School, within the study area (see **Section 3.2.1**) that have been considered in the assessment of potential environmental health and safety risks for children. However, only one school (Magna Vista High School) has a portion of its property within the Alternative Inventory Corridors for the Build Alternatives retained for detailed study.

3.11.1 Alternative A

There are no schools within the Alternative Inventory Corridor for Alternative A; therefore, this alternative would not be expected to pose health or safety concerns that would disproportionately affect children.

3.11.2 Alternative B

Only one school is within a portion of the Alternative Inventory Corridor for Alternative B and that is Magna Vista High School. Magna Vista High School and the adjacent athletic fields would not be directly impacted by any of the alternatives; however, Alternative B would potentially impact a minimal portion of the parcel on which the school sits on. Magna Vista High School is located approximately 220 feet east of Magna Vista School Road in Ridgeway, Virginia. The evaluated new roadway for Alternative B is located west of this location; therefore, no changes are anticipated to occur to the school.

The most likely health and safety risks would be associated with the potential air quality and noise impacts related to any improvements that may advance as a result of Alternative B. Comprehensive analyses of air quality and noise impacts have been conducted for the study (see **Sections 3.6** and **3.7**). The air quality analysis provided in **Section 3.6**, as well as the ***Air Quality Technical Report*** (VDOT, 2020f), show that these improvements would not exceed the NAAQS established by EPA to protect human health and welfare, including children. As described in **Section 3.7**, 11 of the 12 noise impacts to recreational uses under Alternative B would be due to increases in existing noise levels at the Magna Vista High School athletic fields.

3.11.3 Alternative C (Preferred Alternative)

There are no schools within the Alternative Inventory Corridor for Alternative C; therefore, this alternative would not be expected to pose health or safety concerns that would disproportionately affect children.

3.12 SHORT-TERM IMPACTS AND LONG-TERM BENEFITS

Short-term impacts to resources in relation to long-term productivity have been evaluated in accordance with NEPA [42 USC §4332(C)(iv)] and guidelines published by CEQ on implementing NEPA (40 CFR §1502.16). This analysis qualitatively discusses the relationship between short-term impacts to and use of resources, and the long-term benefits and productivity of the environment. Short-term effects and uses are commonly associated with the construction phase of the improvements evaluated in this study, while long-term is defined as the life of the roadway facility through maintenance and operation. This section is not intended to repeat or reiterate the resource analyses and evaluations already discussed in **Chapter 3: Affected Environment and Environmental Consequences**; rather, it documents the tradeoffs between the immediate impacts and long-term gains derived from the implementation of improvements from the Martinsville Southern Connector Study. Overall, the short-term impacts and uses of resources from the alternatives evaluated in this Draft EIS are not expected to detract from the enhancement of long-term productivity and transportation benefits for the local area, region, and Commonwealth of Virginia as a whole.

3.12.1 Short-Term Impacts

Short-term impacts are those that would primarily occur during the construction phase of the improvements evaluated in the Martinsville Southern Connector Study. The illustrative planning-level LOD has been established to define the potential area of impacts and to take into account the approximate extent of the construction limits associated with any of the Build Alternatives retained for detailed study in this Draft EIS. Specific construction staging and access locations have not been determined at this time; potential staging areas and a refined understanding of the specific impacts associated with the alternatives retained would be identified as the design advances and as part of the permitting process for the Martinsville Southern Connector Study.

Short-term impacts generally include changes to traffic patterns, alterations to topography and land use from earth moving and the implementation of transportation improvements, increases in turbidity of streams resulting from sedimentation during land-disturbing activities, and vegetation removal for construction staging areas and equipment storage.

The anticipated short-term impacts associated with the alternatives retained in this Draft EIS are summarized below. The assessment of temporary construction impacts is preliminary and based on the illustrative planning level design developed for the purposes of this study. The characterization and degree of potential short-term impacts are likely to be refined as more detailed design and engineering is developed for any improvements that advance from the Martinsville Southern Connector Study.

3.12.1.1 No-Build Alternative

The No-Build Alternative would not result in short-term impacts.

3.12.1.2 Alternative A

Construction of Alternative A would likely result in short-term impacts associated with the removal of existing vegetation as a result of clearing and grubbing as well as earth moving and grading activities. As a result, a temporary increase in soil erosion may be expected, along with localized degradation of air quality due to fugitive construction dust emissions. In order to minimize and mitigate soil erosion and construction dust emissions, construction activities would be performed in accordance with VDOT's *Road and Bridge Specifications Manual* and would include the use of erosion and sediment control practices. There would also be a need for local water resources for construction activities such as the mixing of aggregates, road wetting, fugitive dust control, and landscaping. Water quality may be temporarily impacted by stormwater runoff, erosion, and sedimentation during roadway construction, clearing, and grading. Temporary impacts to water quality, including those associated with construction activities, would be limited to those authorized under the stipulations and conditions included in any water quality permits acquired for the improvements and minimized through adherence to VDOT's *Road and Bridge Specifications Manual* (VDOT, 2016). Appropriate erosion and sediment control practices would be implemented in accordance with the Virginia Erosion and Sediment Control Regulations and the Virginia Stormwater Management law and associated regulations.

A temporary increase in noise levels may also occur from construction activities including heavy equipment and vehicle operation.

An increase in employment and job opportunities for construction workers, suppliers, and inspectors would result during construction. In addition, short-term employment, use of materials to construct the improvements, and purchases of goods and services generated by construction could create a short-term improvement in the local economy that would diminish once the construction is completed. Workers who live in the region may fill these new positions or it is possible that people may move to the area as a result of the job opportunities created by the study. The concentration of workers within the area may stimulate the local economy by increasing business at area commercial and retail establishments. Increased sales tax could be derived from the commercial sales and from the sales of materials required for construction.

3.12.1.3 Alternative B

Construction of Alternative B would likely result in short-term impacts associated with the removal of existing vegetation as a result of clearing and grubbing as well as earth moving and grading activities. As a result, a temporary increase in soil erosion may be expected along with localized degradation of air quality due to fugitive construction dust emissions. In order to minimize and mitigate soil erosion and construction dust emissions, construction activities would be performed in accordance with VDOT's *Road and Bridge Specifications Manual* and would include the use of erosion and sediment control practices. There would also be a need for local water resources for construction activities such as the mixing of aggregates, road wetting, fugitive dust control, and landscaping. Water quality may be temporarily impacted by stormwater runoff, erosion, and sedimentation during roadway construction, clearing, and grading. Temporary impacts to water quality, including those associated with construction activities, would be limited to those authorized under the stipulations and conditions included in any water quality permits acquired for the improvements and minimized through adherence to VDOT's *Road and Bridge Specifications Manual* (VDOT, 2016). Appropriate erosion and sediment control practices would be implemented in accordance with the Virginia Erosion and Sediment Control Regulations and the Virginia Stormwater Management law and associated regulations.

A temporary increase in noise levels and construction related air emissions may also occur from construction activities including heavy equipment and vehicle operation.

An increase in employment and job opportunities for construction workers, suppliers, and inspectors would result during construction. In addition, short-term employment, use of materials to construct the improvements, and purchases of goods and services generated by construction could create a short-term improvement in the local economy that would diminish once the construction is completed. Workers who live in the region may fill these new positions or it is possible that people may move to the area as a result of the job opportunities created by the study. The concentration of workers within the area may stimulate the local economy by increasing business at area commercial and retail establishments. Increased sales tax could be derived from the commercial sales and from the sales of materials required for construction.

3.12.1.4 Alternative C (Preferred Alternative)

Construction of Alternative C would likely result in short-term impacts associated with the removal of existing vegetation as a result of clearing and grubbing as well as earth moving and grading activities. As a result, a temporary increase in soil erosion may be expected along with localized degradation of air quality due to fugitive construction dust emissions. In order to minimize and mitigate soil erosion and construction dust emissions, construction activities would be performed in accordance with VDOT's *Road and Bridge Specifications Manual* and would include the use of erosion and sediment control practices. There would also be a need for local water resources for construction activities such as the mixing of aggregates, road wetting, fugitive dust control, and landscaping. Water quality may be temporarily impacted by stormwater runoff, erosion, and sedimentation during roadway construction, clearing, and grading. Temporary impacts to water quality, including those associated with construction activities, would be limited to those authorized under the stipulations and conditions included in any water quality permits acquired for the improvements and minimized through adherence to VDOT's *Road and Bridge Specifications Manual* (VDOT, 2016). Appropriate erosion and sediment control practices would be implemented in accordance with the Virginia Erosion and Sediment Control Regulations and the Virginia Stormwater Management law and associated regulations.

A temporary increase in noise levels may also occur from construction activities including heavy equipment and vehicle operation.

An increase in employment and job opportunities for construction workers, suppliers, and inspectors would result during construction. In addition, short-term employment, use of materials to construct the improvements, and purchases of goods and services generated by construction could create a short-term improvement in the local economy that would diminish once the construction is completed. Workers who live in the region may fill these new positions or it is possible that people may move to the area as a result of the job opportunities created by the study. The concentration of workers within the area may stimulate the local economy by increasing business at area commercial and retail establishments. Increased sales tax could be derived from the commercial sales and from the sales of materials required for construction.

3.12.2 Long-Term Benefits and Losses

Upon construction completion of any of the transportation improvements retained for detailed evaluation in this Draft EIS, several long-term benefits would result, enduring the lifespan of the facility. These benefits are primarily associated with addressing the Purpose and Need, as described for each alternative in **Section 2.4**. Compared to the anticipated benefits resulting from the alternatives evaluated, the long-term losses are expected to be commensurate. The long-term gains and losses are described for each alternative below.

3.12.2.1 No-Build Alternative

Under the No-Build Alternative, no long-term benefits are expected for improved mobility of regional traffic, enhanced access for local traffic, or improvements to existing geometric deficiencies. These conditions would continue to degrade the ability of existing Route 220 to effectively provide service to the traveling public.

3.12.2.2 Alternative A

Alternative A would offer a new roadway facility to divert regional truck and passenger car traffic from existing Route 220 onto new alignment, which would accommodate the primary regional through movements in the study area while offering improved access and mobility for local traffic on existing Route 220. Access control, afforded under all alternatives with the exception of the

No-Build Alternative, would provide an additional increase in safety, a reduction in travel time delays and improved mobility through the study area. Enhanced accessibility and mobility for regional and local traffic would also result in more efficient use of fossil fuels for quicker trips. The new alignment of Alternative A is expected to remove some traffic from the existing Route 220 where development and community facilities are most concentrated. Decreased traffic on existing Route 220 is expected to improve local access to residences and businesses, in addition to increasing safety and decreasing air emissions within these communities. Emergency response times could be expected to be improved.

The implementation of Alternative A would require permanent conversion of property, forested areas, and other natural resource areas to transportation uses. Real estate taxes paid of those properties would be eliminated. These long-term losses may be offset by areas adjacent to the improvements that enhance the long-term benefits and associated economic growth that may result from the implementation of Alternative A.

3.12.2.3 Alternative B

Alternative B would offer a new roadway facility to divert regional truck and passenger car traffic from existing Route 220 onto new alignment, which would accommodate the primary regional through movements in the study area while offering improved access and mobility for local traffic on existing Route 220. Access control, afforded under all alternatives with the exception of the No-Build Alternative, would provide an additional increase in safety, a reduction in travel time delays and improved mobility through the study area. Enhanced accessibility and mobility for regional and local traffic would also result in more efficient use of fossil fuels for quicker trips. The new alignment of Alternative B is expected to remove some traffic from the existing Route 220 where development and community facilities are most concentrated. Decreased traffic on existing Route 220 is expected to improve local access to residences and businesses, in addition to increasing safety and decreasing air emissions within these communities. Emergency response times could be expected to be improved.

The implementation of Alternative B would require permanent conversion of property, forested areas, and other natural resource areas to transportation uses. Real estate taxes paid of those properties would be eliminated. These long-term losses may be offset by areas adjacent to the improvements that enhance the long-term benefits and associated economic growth that may result from the implementation of Alternative B.

3.12.2.4 Alternative C (Preferred Alternative)

Alternative C would offer a new roadway facility to divert regional truck and passenger car traffic from existing Route 220 onto new alignment, which would accommodate the primary regional through movements in the study area while offering improved access and mobility for local traffic on existing Route 220. Access control, afforded under all alternatives with the exception of the No-Build Alternative, would provide an additional increase in safety, a reduction in travel time delays and improved mobility through the study area. Enhanced accessibility and mobility for regional and local traffic would also result in more efficient use of fossil fuels for quicker trips. The new alignment of Alternative C is expected to remove some traffic from the existing Route 220 where development and community facilities are most concentrated. Decreased traffic on existing Route 220 is expected to improve local access to residences and businesses, in addition to increasing safety and decreasing air emissions within these communities. Emergency response times could be expected to be improved.

The implementation of Alternative C would require permanent conversion of property, forested areas, and other natural resource areas to transportation uses. Real estate taxes paid of those properties would be eliminated. These long-term losses may be offset by areas adjacent to the improvements that enhance the long-term benefits and associated economic growth that may result from the implementation of Alternative C.

3.13 INDIRECT AND CUMULATIVE EFFECTS

Detailed information on Indirect and Cumulative Effects can be found in the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j). A summary is provided below.

3.13.1 Regulatory Context and Methodology

NEPA does not mention indirect or cumulative impacts; however, CEQ regulations for implementing NEPA address Federal agency responsibilities applicable to indirect and cumulative considerations, analysis, and documentation (40 CFR §1508.25) in the content requirements for the environmental consequences section of an EIS (40 CFR §1502.16) (FHWA, 2014). Additional requirements and processes are discussed in Section 1.3 of the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j).

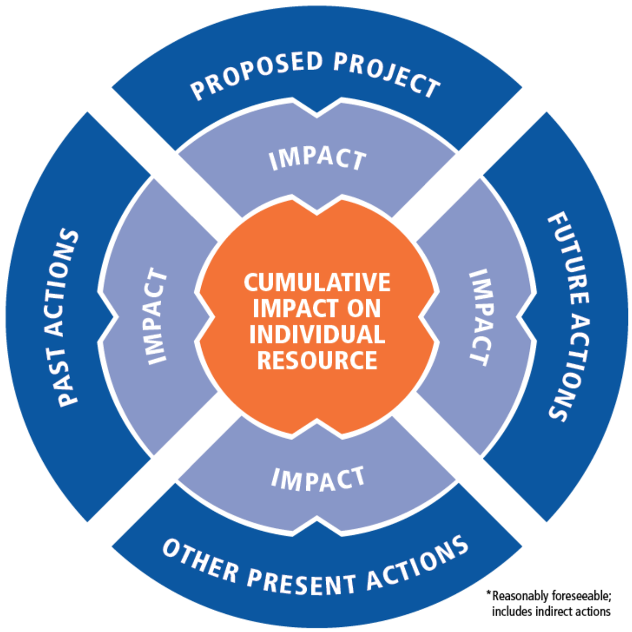
CEQ defines indirect effects as "…effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable" [40 CFR §1508.8(b)]. Indirect effects may include "growth-inducing effects and other effects related to induced changes in the pattern of land use, population density or growth rate, and related effects on air and water and other natural systems, including ecosystems" [40 CFR §1508.8(b)]. These related or induced actions are those that may or may not occur without the implementation of the evaluated Build Alternatives, as illustrated in **Figure 3-16**.

Figure 3-16: Direct vs. Indirect Environmental Impact

Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA 2019.

CEQ defines cumulative effects (or impacts) as, "…the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time" (40 CFR §1508.7). Cumulative effects include the total of all impacts, direct and indirect, on a particular resource that have occurred, are occurring, and/or would likely occur as a result of any action or influence, including effects of a Federal activity (EPA, 1999), as illustrated in **Figure 3-17**.

Figure 3-17: Cumulative Impacts



Source: Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process, FHWA, 2019.

For a more detailed description of the regulatory context, refer to **Section 1.3.1** in the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j).

3.13.1.1 Indirect Effects

The methodology followed for analyzing indirect effects is prescribed in the TRB's NCHRP Report 466, *Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects* (TRB, 2002). In NCHRP Report 466, TRB states that indirect effects can occur in three broad categories: Encroachment-Alteration Impacts, Induced Growth Impacts, and Impacts Related to Induced Growth.

VDOT coordinated with the WPPDC regarding the availability of maps or plans to be used to estimate the potential for growth in the study area. Since no future land use maps or plans were available, the WPPDC agreed that using the zoning maps to estimate the potential for growth was an appropriate methodology. Based upon the review of the zoning maps, and the maturity of the existing transportation infrastructure in the area, VDOT selected an induced growth study area of two miles along major feeder roads. To estimate the extent of induced development that may be associated with each Build Alternative, the amount of land available for development was mapped. For purposes of this study, land identified by the National Land Cover Database (NLCD) as forests, grasslands, and pastures are assumed to be the land available for development. The zoning designation was then identified for each mapped parcel and summarized by alternative.

The stepwise process TRB recommends in NCHRP Report 466 for assessing indirect effects has been used as the structure for this analysis, and consists of the following steps: Scoping, Identify Study Area Direction and Goals, Inventory Notable Features in the Study Area, Identify Impact-Causing Activities of the Build Alternatives, Identify Indirect Effects for Analysis, Analyze Indirect Effects and Evaluate Analysis Results, and Assess Consequences and Develop Mitigation. To complete these steps, the required analyses rely on planning judgment. Each of the steps for the indirect effects evaluation process is discussed in **Section 3.13.2**.

For a more detailed description of the methodology for indirect effects, refer to **Section 1.3.2** in the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j).

3.13.1.2 Cumulative Effects

To document cumulative effects for this study, the analysis followed the five-part evaluation process outlined in Fritiofson v. Alexander, 772 F.2d 1225 (Fifth Cir. 1985), as described in FHWA's Guidance: *Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process* (FHWA, 2019).

1. What is the geographic area and temporal boundaries affected by the study?
2. What are the resources affected by the study?
3. What are the other past, present, and reasonably foreseeable actions that have impacted these resources?
4. What are those impacts?
5. What is the overall impact on these various resources from the accumulation of the actions?

Each of these parts of the cumulative effects evaluation process is discussed in **Section 3.13.3**.

3.13.2 Indirect Effects Analysis

3.13.2.1 Step 1: Scoping

The first step in the indirect effects analysis involves scoping activities. As part of this scoping effort each local government's comprehensive and/or capital improvement plans were reviewed and scoping letters and questionnaires were mailed to Federal, state, and local agencies to obtain pertinent information and to identify key issues regarding indirect and cumulative effects (ICE). Additional information on scoping is provided in **Section 6.2.1** of this Draft EIS and **Section 2.1** Step 2: Identify Study Area Direction and Goals

<u>Study Areas</u>

Input from the scoping process was used to inform the identification of resource-specific study areas for this indirect effects analysis. The method for establishing the ICE Study Areas was established in the Martinsville Southern Connector Study's Resource Identification and Impact Environmental Analysis Methodologies, which was approved on July 2018. In total, four study areas were developed as part of this indirect effects analysis: Socioeconomic Resources, Natural Resources, Historic Resources, and Induced Growth.

- The ICE Socioeconomic Resources Study Area supports the analysis of indirect and cumulative effects on community facilities, parks, land use, and similar elements of the built environment. The ICE Socioeconomic Resources Study Area contains all the census block groups that overlap one or more of the alternatives retained for evaluation (see **Figure 3-18**).
- The ICE Natural Resources Study Area supports the analysis of indirect and cumulative effects on natural areas, watersheds, wildlife, and similar elements of the natural environment. The ICE Natural Resources Study Area contains all the local subwatersheds (HUC 12) that overlap one or more of the alternatives retained for evaluation (see **Figure 3-19**). Subwatersheds are used as the basic unit of the ICE Natural Resources Study area because many environmental processes either operate at the subwatershed scale (*e.g.* seasonal flooding) or are sensitive to subwatershed condition (*e.g.* water quality and habitat impairments). Although none of the potential improvements would take place in North Carolina, the ICE Natural Resources Study Area crosses the state line to capture the entirety of the Matrimony Creek-Dan River subwatershed.

- The ICE Historic Resources Study Area supports the analysis of indirect effects to architectural and archaeological resources. Indirect effects such as altering the setting, feeling and association of archaeological and architectural historic properties are considered under Section 106 of the NHPA. The types of indirect effects that are assessed for the ICE analysis are changes to accessibility or visitation during or after construction. The boundary of the ICE Historic Resources Study Area is the APE developed under the Section 106 process (see **Figure 3-20**).

- The Induced Growth Study Area supports the consideration of indirect effects associated with changes in land use influenced by the potential improvement. The Induced Growth Study Area is a composite of three buffers. The first buffer captures land within one mile of the center of an evaluated or existing interchange associated with the Build Alternatives. The second buffer captures land within 1,000 feet of the new roadway alignment. This buffer is included to present the frontage roads that would be constructed throughout most of the evaluated alignments. The third buffer captures land within 1,000 feet of feeder roads connected to potential or existing interchanges associated with the Build Alternatives. These feeder roads extend up to two miles from the center of their associated interchanges. Figures illustrating the Induced Growth Study Areas for each of the Alternatives Retained for Evaluation can be found in **Section 3.13.2.6**.

Figure 3-18: ICE Socioeconomic Resources Study Area

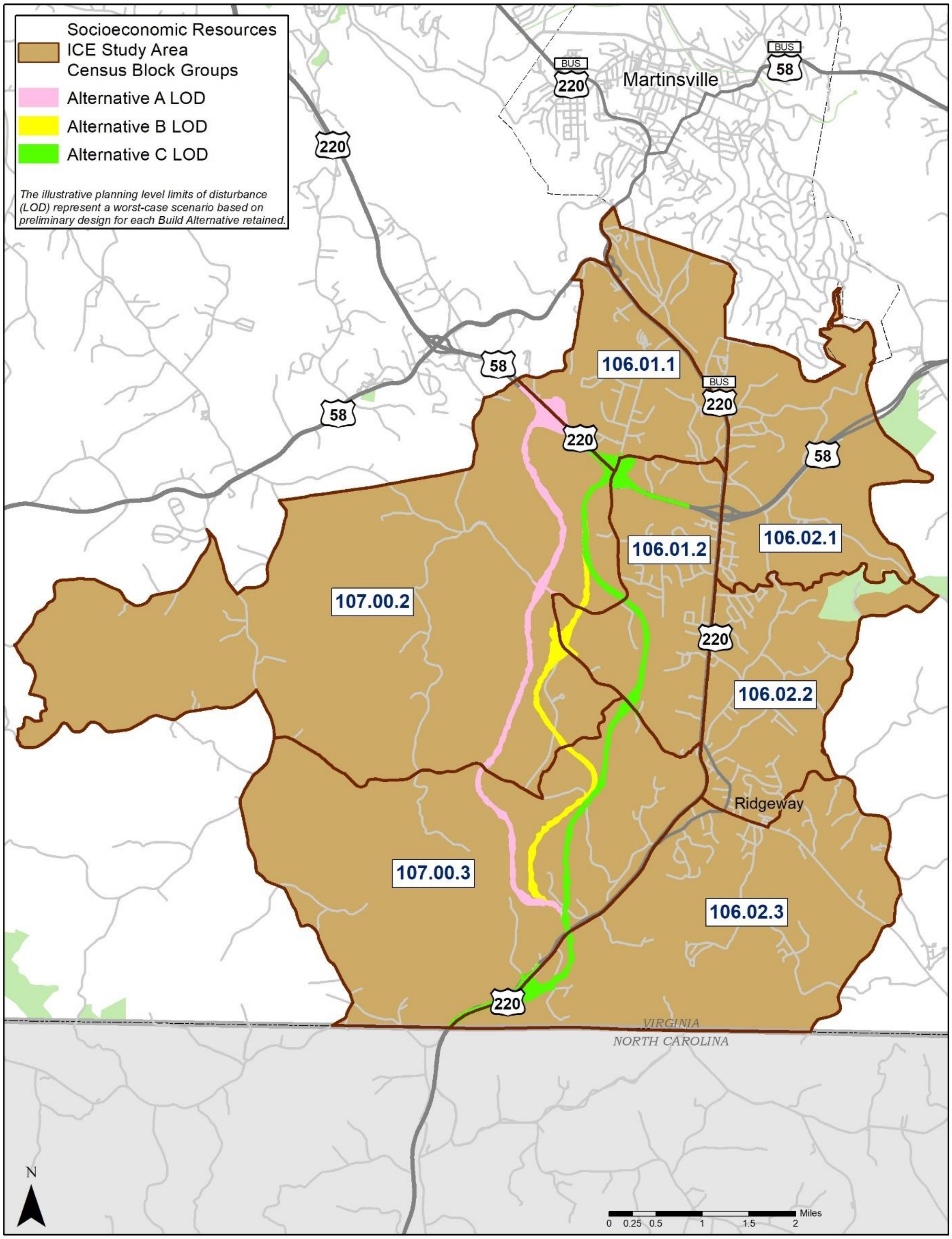


Figure 3-19: ICE Natural Resources Study Area

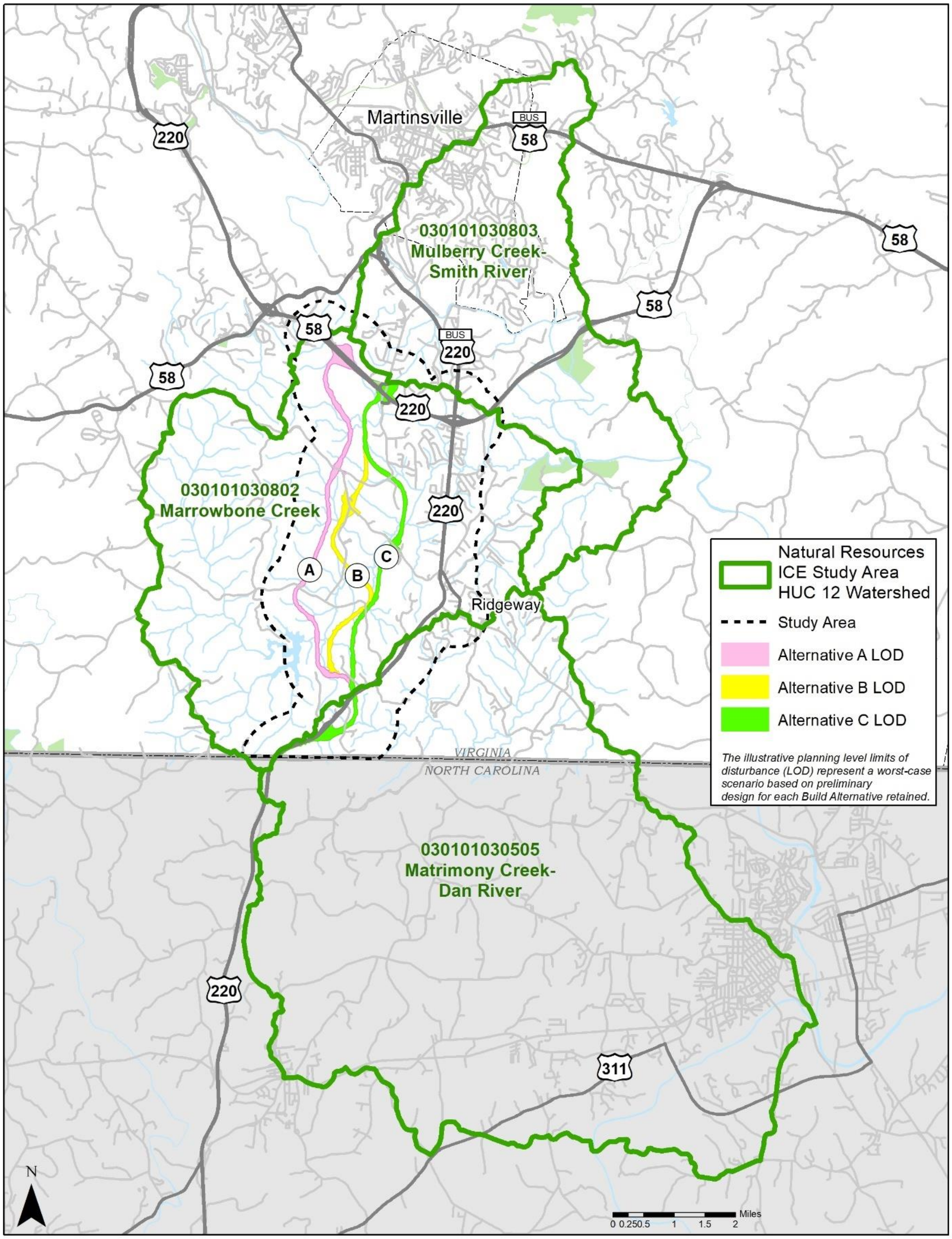
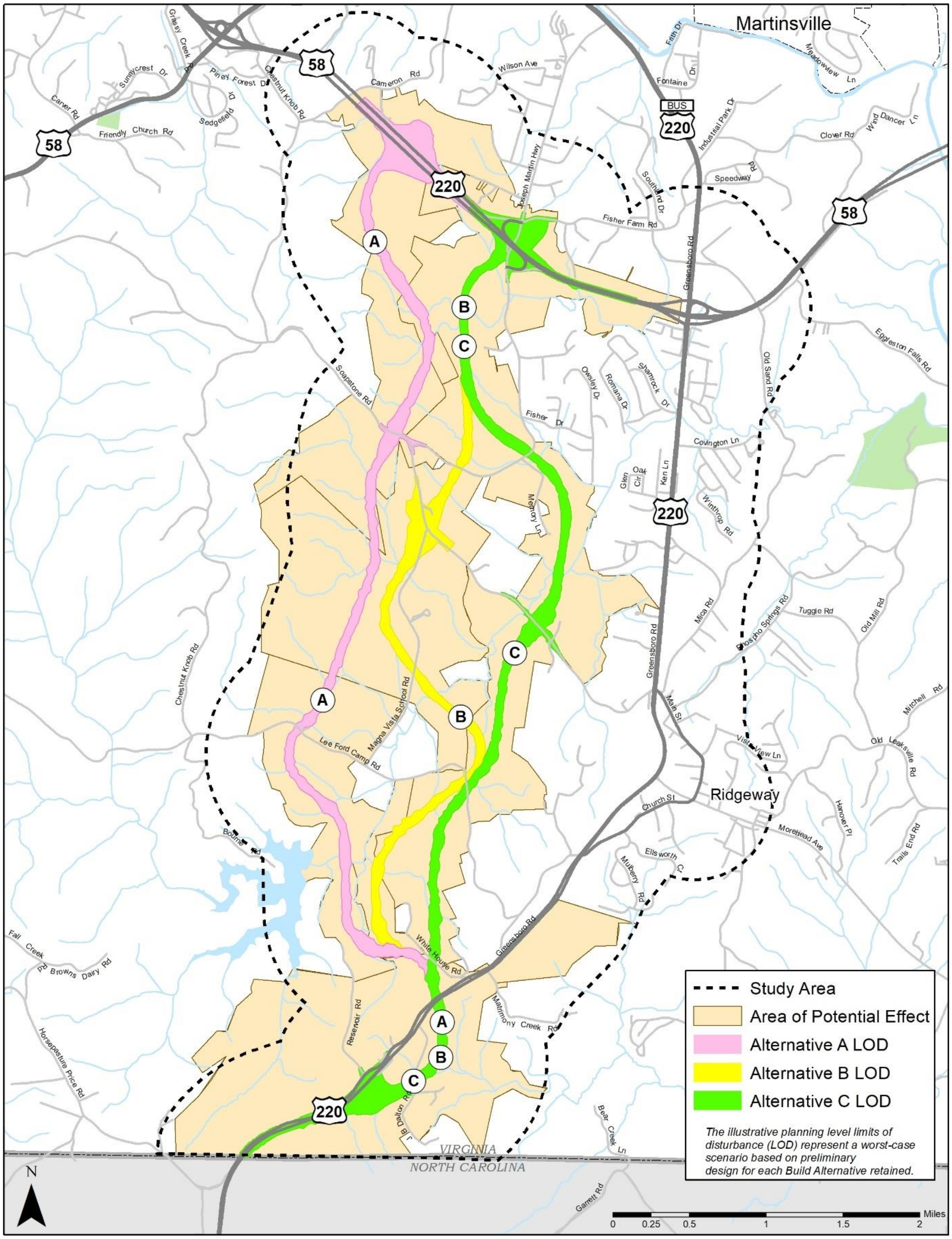


Figure 3-20: ICE Historic Resources Study Area



Direction and Goals

The way in which a highway project affects a community is driven by more than the project design. Evidence gathered from state departments of transportation around the country indicates that a project's impact is strongly influenced by a community's policies and history. Some important factors identified include: local land use policies, development incentives, availability of developable land, and the investment climate (TRB, 2002). To fully assess how a community might respond to a potential alternative, it is useful to develop a thorough knowledge of demographic, economic, and social trends. It is also important to understand the regional goals for consideration of potential indirect effects to the natural environment, and whether potential effects are in line with local goals as a determinant of impact significance and an indicator of effects that merit further analysis. Detail regarding the existing and planned land use, population, employment, and economic development trends in the ICE Socioeconomic Resources Study Area, and environmental resource impact trends and protection goals within the ICE Natural Resources Study Area and ICE Historic Resources Study Area is provided in Section 2.2.2 of the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j).

3.13.2.2 Step 3: Inventory Notable Features in the ICE Study Areas

Notable resources for this study that were considered to be particularly relevant for the analysis of impacts from a transportation project include socioeconomics and land use (including communities, community facilities and parks, EJ, and economics); natural resources (including streams, wetlands, water quality, floodplains, wildlife habitat, and threatened and endangered species); and historic resources. These resources are described in detail in Section 2.3 of the ***Indirect and Cumulative Effects Technical Report*** (VDOT ,2020j).

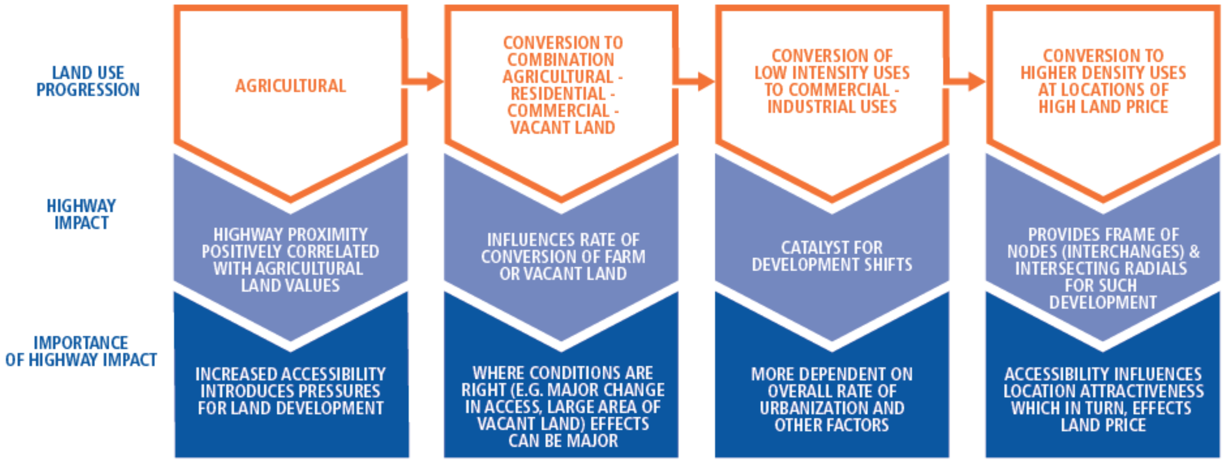
3.13.2.3 Step 4: Identify Impact-Causing Activities of the Build Alternatives

The objective of this step is to identify direct impacts that could have indirect effects that may conflict with the regional directions and goals discussed in **Step 2** and/or impact the resources identified in **Step 3**. The NCHRP Report 466 includes groups of actions associated with transportation projects that are known to trigger indirect effects (TRB, 2002). Some examples of these impact-causing activities include alteration of drainage, channelization, noise and vibration, cut and fill, barriers, excavation, erosion and sediment control, landscaping, and alteration of travel time/cost. The estimated direct impacts due to impact-causing activities are summarized in **Table 3-1** in **Section 3.1**. Comparing impact-causing activities to regional directions and goals and the resources in the ICE Study Areas enables the identification of resources that could be indirectly affected. The findings of this identification process are presented in **Step 5**.

3.13.2.4 Step 5: Identify Indirect Effects for Analysis

The objective of this step is to assess whether direct impacts identified in **Table 3-1** in **Section 3.1** would cause indirect impacts. The indirect effects analysis focuses on the potential for socioeconomic and ecological impacts that could occur outside of the area of direct impact because of the alternatives. Development of vacant land or conversion of the built environment to more intensive uses are often consequences of highway projects. NCDOT's *Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Vol. II: Practitioners Handbook* provides characteristics for induced growth as well as illustrates the different stages of development (see **Figure 3-21**) (NCDOT, 2001).

Figure 3-21. Highway Investment on Typical Progress of Urbanization



The Build Alternatives retained for detailed evaluation would involve the construction of a new access controlled roadway alignment with access-controlled interchanges. The direct impacts associated with this construction would have the potential to cause indirect impacts to socioeconomic resources, natural resources, and historic resources. Additionally, all the Build Alternatives have the potential to stimulate new land development at their access points, resulting in the potential for induced growth. Since indirect effects are possible, socioeconomic resources, natural resources, and historic resources will be discussed further in **Step 6** in this analysis.

3.13.2.5 Step 6: Analyze Indirect Effects

No-Build Alternative

Encroachment Effects on Socioeconomic Resources

With continued use of existing Route 220 as the area's primary road for regional and freight traffic, additional truck and passenger car volumes are expected to occur. This increase in volume would adversely impact the ability of residents and commuters to access local businesses. Route 220 would continue to represent a physical barrier between the communities and community facilities due to the associated high percentage of truck traffic. As traffic volumes increase in the future, crossing Route 220 would become increasingly difficult and dangerous, continuing the community fragmentation of residences located on either side of the roadway. Additionally, the increased traffic volume would emphasize the fragmentation and further contribute to traffic delays. These conditions would also continue to inhibit the movement of emergency vehicles traveling along Route 220. Since travel delay along the corridor would likely increase, access by residents to community facilities, such as Drewry Mason Elementary School, would be adversely impacted, also impacting minority and low income families that use these community facilities. However, since the operational repercussions of the No-Build Alternative are not localized, the No-Build Alternative would not result in disproportionate and adverse impacts to EJ populations.

The increase in truck and passenger vehicles on Route 220 could contribute to safety concerns to adjacent communities. Additional proximity impacts, such as traffic noise, are also expected as a result of the increased traffic along the existing roadway network. Please see the ***Traffic and Transportation Technical Report*** for a more detailed discussion of traffic conditions within the ICE Socioeconomic Resources Study Area.

Encroachment Effects on Natural Resources

Water Resources

With continued use of Route 220 as the area's primary road for regional and freight traffic, pollutants associated with automotive travel would continue to enter nearby water bodies via surface runoff. These pollutants include vehicle exhaust, brake pad materials, fuel and oil spills/drippings, and hydraulic or other fluids. Many of the listed pollutants contain copper and nitrogen, which can impair water quality. In the absence of modern stormwater management system improvements that would be associated with construction of one of the Build Alternatives, existing indirect effects associated with untreated or poorly treated stormwater runoff would continue (refer to **Section 3.5.1.1** for further discussion of water quality). Degradation of water resources adjacent to the roadway to continue as additional truck and passenger car volumes are expected to occur.

Floodplains

Under the No-Build Alternative, existing and planned developments would be anticipated to impact floodplains.

Wildlife Habitat

Under the No-Build Alternative, existing and planned developments would be anticipated to degrade wildlife habitat.

Threatened and Endangered Species

The No-Build Alternative is not anticipated to have any indirect effect on threatened and endangered species within the ICE Natural Resources Study Area.

Encroachment Effects on Historic Resources

As with socioeconomic resources, the increase in truck and passenger car volumes would adversely impact the ability of visitors to access the two historic properties located along Route 220. Additionally, proximity effects, such as increased traffic noise, could continue to affect historic properties along the existing roadway.

Induced Growth Effects

No induced growth is expected under the No-Build Alternative, as no new interchanges or access points would be constructed. While much of the area along Route 220 is already developed, planned and/or approved for development (such as the Commonwealth Crossing Business Centre), or is zoned to allow development, the increase in truck and passenger car volumes along Route 220, with no associated improvements, could affect the desirability of developing in this area. The increase in traffic volumes on Route 220 could reduce desirability for local residents through increased delays; however, the slower speeds of increased traffic could attract more customers to the local businesses.

Alternative A

Encroachment Effects on Socioeconomic Resources

The potential relocation of 17 residences (three of which are in EJ block groups) and potential acquisition of 574 acres of right of way would result in properties that were previously not near a major roadway, now being immediately adjacent to the new alignment. Some of these adjacent property owners may choose to leave even though their property is not directly impacted by the alternative. These secondary relocations could indirectly degrade long-term community cohesion. This indirect effect would affect both EJ and non-EJ communities. Alternatively, replacement uses, such as commercial or industrial development, could occur in the new front row of properties, especially near the existing and evaluated interchanges. Additionally, the introduction of new access points and a new roadway could improve travel times for residents located near the new roadway, possibly making those areas more desirable in the long-term.

The construction of Alternative A would redirect regional traffic away from business located on existing Route 220 between Soapstone Road and Route 58. While this may have some adverse impact to local business, traffic modeling indicates that the majority of regional trips that travel through the length of the corridor do not stop. Therefore, redirecting regional traffic away from Route 220 would have limited adverse effect on local business. Alternatively, reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents. Studies on the impact of bypasses on rural towns and communities, where a road or highway avoids a built-up area or town to let through traffic flow without local traffic interference, support the potential for such effects; however, these studies also indicate that the changes caused by bypasses in the rural environment are minimal (Rogers, Marshment, 2000; TRB, 2014).

During the consideration of possible indirect effects, it is important to note that this study does not address how existing Route 220 would be managed in the future. Decisions on how the road would be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes that may be implemented along the existing corridor would have a great influence on how the potential indirect effects are realized.

Encroachment Effects on Natural Resources

Water Resources

Construction of Alternative A would require the clearing of approximately 318 acres of forests. This change in land cover would decrease the capacity of the affected watershed to sequester heavy rainfall through evapotranspiration. While the areas converted to roadway would remain unvegetated long-term, vegetation removal and amount of denuded ground surfaces are likely to be highest during construction.

Construction activities such as the use of heavy equipment and staging of materials may also contribute to increased soil compaction. Compacted soils have reduced rates of rainfall infiltration, thus contributing to increased surface runoff. Increased runoff from land-clearing and ground disturbance associated with construction has the potential to introduce additional sediment and nutrients into downstream waters. These added sediments and nutrients can affect the physical and chemical properties of receiving waters. For example, increased sediment loads can reduce water clarity, storage capacity, and quality of habitat in streams, ponds, and wetlands. Increased nutrient loads may lead to eutrophication (excessive richness of nutrients) in water bodies, which can result in low oxygen levels and the proliferation of harmful algae and bacteria. These effects related to construction are expected to be short-term, and proper use of stormwater management and erosion and sediment control measures can reduce the severity of these impacts.

Thermal pollution is also a potential indirect effect on water quality. The removal of 318 acres of forest could lead to more direct exposure of approximately 70 stream reach impacts, associated with Alternative A, to solar radiation. Additionally, common roadway materials absorb heat which can then be transferred to surface runoff flowing across the roadway. An increase in ambient water temperature or pollutants can impair valuable ecological functions by harming aquatic organisms as well as contribute to eutrophication.

Should the construction of the new roadway alignment require streams to be relocated, straightened, piped through culverts, or lined, the change in slope, number and extent of curves, and hydraulic roughness (frictional resistance) could affect the velocity of the water through, and downstream of, the directly-impacted sections. Stormwater drainage channels associated with construction and maintenance of the roadway would likely drain into existing streams. Due to high flow velocities often observed through pipes or within hardened channels, there is an increased risk of bed and bank erosion often present at, and/or downstream of, these drainage connections.

Other indirect effects of adding hard structures along the stream channels can also include the limitation of the stream's natural ability to move laterally in response to changes within the watershed.

As discussed previously, the permanent removal of vegetation, compaction of soils, and addition of impervious surfaces within the watershed all increase stormwater runoff (VDEQ, 2019b). This runoff often drains into streams and rapidly increases the peak velocity and volume of flow within the channel, commonly referred to as flashiness. Greater velocities are likely to increase erosion along the stream bed and/or banks (VDEQ, 2019b). Erosion or downcutting along the stream bed, known as degradation, can cause a stream to become disconnected from its floodplain. The inability for the stream to access its floodplain often leads to an increased rate of stream bank erosion, which can impact valuable infrastructure. The clearing of trees and other vegetation in riparian buffers can worsen this risk, as roots provide structural stability to the banks, and above-ground growth provides surface roughness to reduce flow velocities. Stream channels that become deeply incised can also lower the surrounding water table, draining adjacent wetlands and altering the nearby vegetative composition (Rosgen, 1997).

Increased loads of runoff, nutrients, sediment, and chemical pollutants can have long-term effects on the physical, chemical, and biological processes in wetlands. Many wetland plants and animals are adapted to specific hydrologic conditions and could be extirpated if those conditions are altered severely. Alternative A would have the potential to generate additional indirect effects to the wetland areas in proximity to the new alignment through habitat conversion. In this case, habitat conversion refers to changes in the composition of a wetland's plant community that could occur because of changes in the availability of light. In areas where canopy cover would be removed, the increase in light would reduce the competitiveness of woody wetland species that are adapted to shady conditions and support the colonization of the site by more sun-tolerant species. In some cases, the new plant community may be comprised of native species. However, the rapid alteration of environmental conditions brought on by deforestation can facilitate the introduction and expansion of invasive species. An increased presence of invasive species would in turn indirectly affect wetlands by disrupting the ecological process associated with specific native plant species. This change in the biological community, combined with an increased presence of road-sourced water pollutants, could cause wetlands outside of the potential LOD for Alternative A to fail or be negatively altered.

The severity of adverse indirect effects generated by Alternative A on streams, wetlands, and overall water quality can be reduced and/or neutralized through the construction of stormwater management facilities and any mitigation measures determined to be warranted through the regulatory permitting process. In the southern section of Alternative A (from the Virginia-North Carolina state line to Reservoir Road), for example, the replacement of existing stormwater management facilities with facilities designed to meet more rigorous environmental requirements would reduce the severity of existing impairments caused by highway drainage. In the segment north of Reservoir Road, the construction of stormwater management, outside of aquatic habitats, would provide some of the lost sequestration capacity and therefore reduce the generation of related impairments. Mitigation measures, such as those described above, would not only help restore capacity, but would also help restore degraded natural areas. During more detailed phases of project development, the appropriate mitigation measures would be identified and designed.

Floodplains

Construction of Alternative A could potentially cause indirect effects due to the 7.0 acres of direct impact to 100-year floodplain. These indirect effects could include changing drainage patterns, water quality degradation, changes in flood flow levels, and associated effects on floral and faunal communities. Fill floodplains would also result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion (FEMA, 2016). However, the implementation of adequately sized and properly-placed culverts, bridges, and stormwater BMPs can reduce the severity of, or eliminate, indirect impacts to floodplains by allowing the controlled release and sufficient passage of stormwater.

Wildlife Habitat

The development of Alternative A could indirectly affect the ICE Natural Resources Study Area's wildlife habitat by altering vegetative structure and species composition, expanding highway usage, and altering hydrologic regimes. Alternative A would impact approximately 489 acres of wildlife habitat. The majority of these impacts would occur in the northern section of Alternative A (Reservoir Road to Route 58) where large contiguous blocks of forests would be cleared within the maintained right of way. This would lead to the creation of more open space and edge habitats. The creation of additional edge habitats could indirectly affect the ICE Natural Resources Study Area's forests by creating opportunities for invasive plants to spread, causing habitat conversion, and fragmenting habitats.

Clearing vegetation for the maintained right of way could allow invasive plants to spread into areas that are currently occupied by native species. Many invasive species thrive in disturbed areas where vegetation has been removed and soil exposed. This could result in the expansion of existing colonies or the creation of new colonies created through the introduction of invasive species on construction equipment and vehicles. Over time, the increased presence of these colonies of invasive plants could alter the structure and functioning of otherwise unimpacted wildlife areas. A change in the composition of plant species can affect wildlife movement by altering food supply, shelter, or travel corridors due to plant density in the understory.

In some cases, the change in environmental conditions along new forest edges is substantial enough to cause habitat conversion. In the case of forested wetlands, for example, the removal of nearby canopy trees can change light conditions enough that the wetland's shade-tolerant woody plants are replaced with herbaceous plants more adapted to direct sunlight. In the case of the animal communities, habitat conversion at the edges of woodlands can increase the abundance of species which thrive at the margin between grasslands and forests. Examples of these species include white-tailed deer, rabbits, racoons, and opossums. However, other species that are better suited for forest-interior dwelling may not be able to persist. Over time, these effects could reduce the size and diversity of wildlife communities.

Habitat fragmentation occurs when disturbance events, like the construction of a highway or the clearing of land for agriculture, break large and contiguous natural areas into isolated patches. In this case, the construction of a roadway on new alignment fragments habitat by creating new barriers and hazards to animals attempting to reach resources on the other side of the road. Habitat fragmentation can have wide-ranging adverse effects on wildlife, including:

- reduced availability of food sources;
- difficulty finding mates;
- increased pressure from outside predators;
- the creation of physical barriers to movement and seasonal migration.

Another way the expansion of highway facilities has the potential to indirectly affect the ICE Natural Resources Study Area's wildlife habitat is by increasing the intensity and prevalence of roadway noise. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Such indirect effects could occur where the evaluated alignment is not utilizing the existing Route 220 corridor.

In addition to the immediate loss of habitat through direct impacts, these disturbances could indirectly affect the ICE Natural Resources Study Areas' wildlife habitats by altering surface-water hydrology. Impacts to streams could indirectly affect wildlife habitats by altering the chemical and physical characteristics of water flowing to downstream communities. Impacts to floodplains and wetlands, as well as an increase in impervious surface coverage could reduce the ability of the affected watershed to attenuate precipitation, and therefore exacerbate stream flashiness and other habitat impairments associated with soil erosion.

The severity of habitat impacts caused by altered hydrology can be reduced by the proper use of erosion and sediment control measures and stormwater management practices. The potential fragmentation of stream habitats directly impacted by the development of Alternative A could be avoided through the use of facilities and structures which preserve stream morphology and hydrologic connectivity. For example, bridges can be used in lieu of culverts or pipes across larger streams. Bridges may also provide areas for wildlife to safely cross beneath the roadway. In smaller streams, countersunk culverts could be used to preserve the structure of the impacted streambeds and therefore provide safe passage for some forms of wildlife.

Construction activities associated with the implementation of Alternative A could potentially result in temporary indirect effects to wildlife habitat. Increased noise, human activity, and dust caused by the operation of heavy machinery, installation of access roads, and staging of building materials could temporarily fragment habitat and displace wildlife. The severity of these effects could be reduced through proper location and minimization of staging areas and construction access roads in valuable habitats. In addition, these effects on wildlife habitat would be temporary as construction activities at any one place are short-term in nature.

Threatened and Endangered Species

Impacts to threatened and endangered species for Alternative A would be similar to the impacts to wildlife habitat discussed in the preceding section, except that the characteristics of many threatened and endangered species tend to render them less resilient when faced with habitat loss/alteration or competition from invasive species.

In October 2019, the VDGIF VaFWIS database (three-mile search radius), the VDGIF WERMS database, the USFWS IPaC database, the VDCR-DNH online searchable database and NHDE, VDOT's CEDAR system, the CCB Mapping Portal, and the USFWS Virginia Field Office's Bald Eagle Map Tool were queried to identify threatened and endangered species that could potentially be affected by the Build Alternatives. The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 3-32**). The potential indirect effects from Alternative A on these species are the same as those discussed for wildlife habitat.

Table 3-32: Threatened and Endangered Species within the ICE Natural Resources Study Area

Species (Scientific Name)	Species (Common Name)	Status[1]
Echinacea laevigata	Smooth Coneflower	FE, ST (VA), SE (NC)
Fusconaia masoni	Atlantic Pigtoe	FT (Proposed), ST (VA, SE (NC)
Lasmigona subviridis	Green Floater	ST (VA), ST (NC)
Laterallus jamaicensis	Eastern Black Rail	FT (Proposed),
Moxostoma ariommum	Bigeye Jumprock	ST (NC)
Myotis lucifugus	Little Brown Bat	SE (VA)
Myotis septentionalis	Northern Long-eared Bat	ST (VA)
Noturus gilberti	Orangefin Madtom	FE, SE (VA), SE (NC)
Percina rex	Roanoke Logperch	ST (NC)
Pleurobema collina	James Spinymussel	FE, ST (VA), SE (NC)
Polemonium reptans var. reptans	Jacob's Ladder	ST (VA), ST (NC)
Tradescantia virginiana	Virginia Spiderwort	ST (NC)

[1] Status Key: FE = Federally Endangered; FT = Federally Threatened; SE = State Endangered; ST = State Threatened
Source: VDGIF-VaFWIS, USFWS-IPaC, VDGIF-WERMS, VDCR-DNH, NHDE, and VDOT CEDAR databases queried October 2019.

For aquatic species listed as threatened or endangered, such as fish and mussels, common threats to their survival include changes in water quality, water turbidity, and stream substrate material. As discussed previously, Alternative A would have the potential to increase runoff. An increase in runoff can lead to additional sediment and pollutants being carried into streams as well as increasing flow velocities, turbidity, and erosion. Any existing habitat or populations of the protected aquatic species within the ICE Natural Resources Study Area could be adversely impacted by these indirect effects.

Bat species within the ICE Natural Resources Study Area for Alternative A could be indirectly affected by the clearing of trees; increase in traffic, noise, and lights; and construction of bridges. Bat species such as the northern long-eared bat and little brown bat often use trees that are hollow or have shaggy bark for roosting during part of the year (NatureServe Explorer, 2019b). Increased noise and light associated with motor vehicle traffic may also dissuade bats from roosting in the areas adjacent to the roadway. However, bats will also occasionally roost beneath bridges for part of the year (NatureServe Explorer, 2019b). Construction of new bridges may provide additional roosting habitat for protected bat species.

The loggerhead shrike is a protected predatory bird species. The shrike prefers open fields and grasslands to forage (NatureServe Explorer, 2019c). Conversion of forests to open areas for roadway construction may provide suitable foraging habitat if the vegetation is not regularly maintained. Conversion of existing grasslands or open fields to roadways could potentially have adverse effects on the loggerhead shrike by reducing the area of suitable foraging habitat.

Protected plant species, such as the smooth coneflower, often require very specific conditions in order to survive. Changes in sunlight exposure, grazing pressure, vegetative competition, and soil moisture can impact the coneflower. The coneflower prefers areas with at least partial exposure to sunlight and is occasionally found along roadsides due to the break in the tree canopy (NatureServe Explorer, 2019d). Construction of a road on new alignment could potentially create or improve conditions suitable for the smooth coneflower by reducing the amount of tree cover and reducing the vegetative competition. However, it may indirectly have adverse effects to any existing habitat or populations through alteration of wildlife movement and grazing pressure, changes in surface hydrology, and invasive species colonization.

Should any improvements from the Martinsville Southern Connector Study advance to detailed design, refinements would avoid and minimize impacts to habitats associated with rare, threatened, and endangered species as well as the overall limit of disturbance.

Encroachment Effects on Historic Resources

Four architectural resources are located within the direct or indirect effects APE for Alternative A. During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short-term and therefore minor. Based upon the direct and/or indirect effects, Alternative A would have the potential to adversely affect one historic resource and/or impact their NRHP eligibility.

Induced Growth Effects

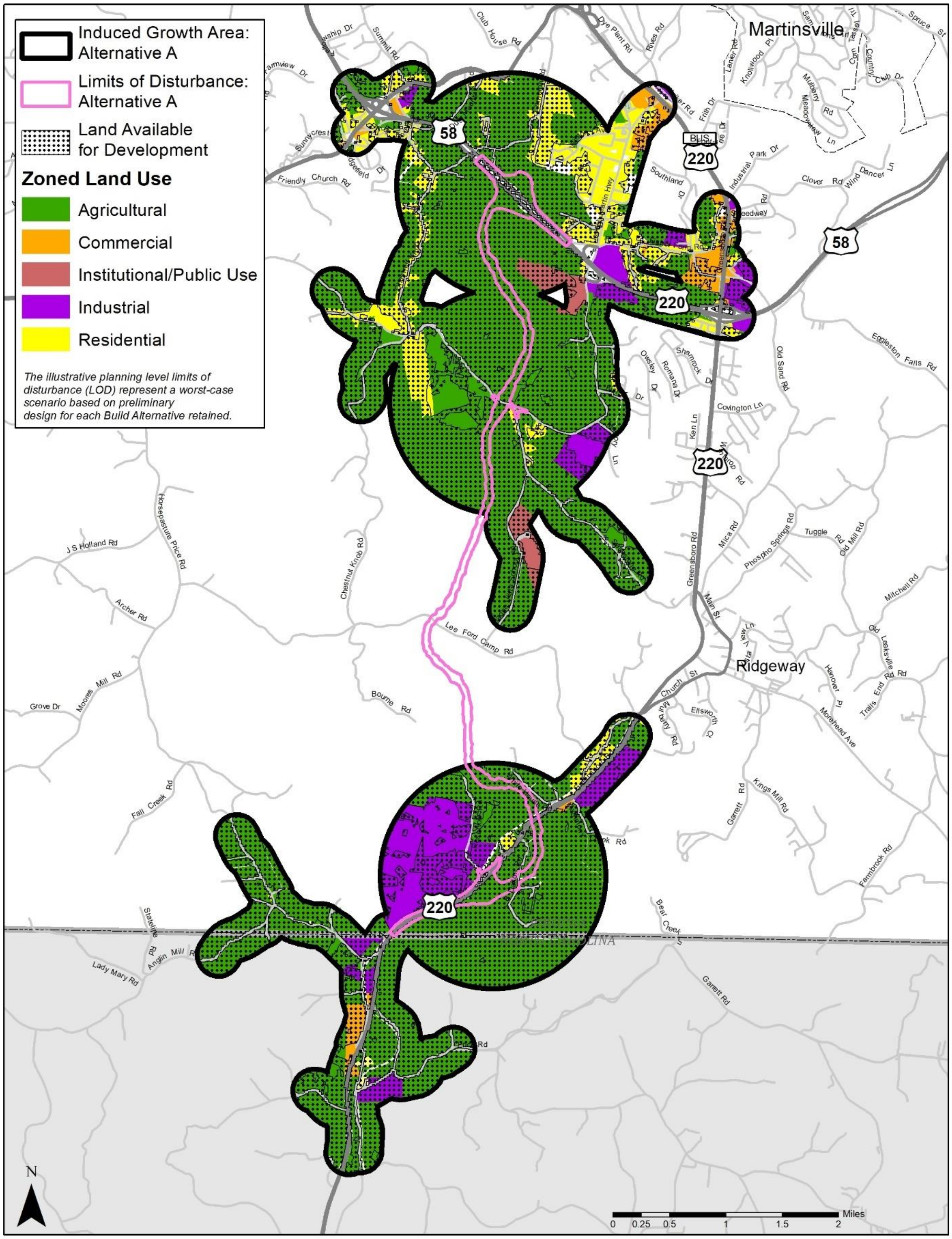
Induced growth could occur with the implementation of Alternative A because it would introduce a new roadway, shift regional traffic, and create new access points. To estimate the potential for induced growth, land available for development (identified by NLCD as forests, grasslands, and pastures) was identified (see **Figure 3-22**). The zoning designation was then identified for each mapped parcel. The total acres available for development within each zoned land use are summarized in **Table 3-33**.

Table 3-33: Zoned Land Use in Land Available for Development within Induced Growth Area

Zoned Land Use	Land Available for Development within Induced Growth Area					
	Alternative A		Alternative B		Alternative C (Preferred)	
	Acres	%	Acres	%	Acres	%
Agricultural	6,550	84%	6,130	82%	5,723	79%
Commercial	115	1%	191	3%	258	4%
Institutional/Public Use	110	1%	177	2%	190	3%
Industrial	460	6%	520	7%	494	7%
Residential	554	7%	435	6%	554	8%
Total Land Available for Development within the Induced Growth Area for Each Alternative	**7,789**		**7,453**		**7,218**	

Note: Shaded columns denote Preferred Alternative.

Figure 3-22: Alternative A Induced Growth Area - Zoned Land Use



Based on this methodology, approximately 7,800 acres are available for development within the induced growth area. Approximately 84 percent (6,550 acres) are zoned for agricultural, one percent (115 acres) are zoned for commercial, one percent (110 acres) are zoned for institutional/public use, six percent (460 acres) are zoned for industrial, and seven percent (554 acres) are zoned for residential land use. The potential for development would be greatest in areas proximate to other developed areas, especially for those areas that already have utilities available. The extent, intensity, and character of the new development is unclear at this time; many factors that operate beyond the scope of this study (*e.g.* local development policies and incentives, favorable economic conditions, and ease of financing) would influence development outcomes. However, considering the existing land cover, it is reasonable to conclude that any induced growth that does occur would likely involve the clearing of land rather than infill or redevelopment. Additionally, since limited growth has occurred over the last ten to 20 years, rapid growth in the area is not anticipated. Should new development occur, the tax base would increase and would serve as funding for the increased demand on existing community facilities.

Although approximately one-third of the Induced Growth Study Area for Alternative A is located within EJ census block groups, the effect to the existing housing stock should be minimal since 554 acres of land available for development are zoned for residential. These parcels, as well as the 6,550 acres of agricultural land, would likely be developed prior to the redevelopment of existing housing stock.

The lands within the Induced Growth Area of Alternative A are covered by two local planning documents: the *Henry County Comprehensive Plan* and the *Rockingham County Land Use Plan* (HCPC, 1995; Rockingham County, 2006). Neither of these documents identify the Martinsville Southern Connector as a future project. However, both identify the Route 220 corridor as an area where growth is expected and desired.

Induced growth could have both beneficial and adverse effects on the ICE Socioeconomic Resources Study Area's economic resources. The potential conversion of rural lands around the evaluated interchanges could create opportunities for businesses which require ready access to the highway system and exposure to regional traffic. This development would, in turn, create employment opportunities and generally increase the local demand for labor.

There is also the possibility that commercial development around the new interchanges and the rerouting of regional traffic could reduce the viability of the commercial properties located on Route 220 between Reservoir Road and Route 58 that rely on exposure to regional traffic. The severity and immediacy of this effect is constrained by the time required to construct a similar density and diversity of services along the evaluated alignment. Another mitigating factor is the preservation of the Route 220/Route 58 interchange. This interchange would still provide the existing businesses easy access to the highway system and the regional traffic. Additionally, the reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents. Studies on the impact of bypasses, where a road or highway avoids a built-up area or town to let through traffic flow without local traffic interference, on rural towns and communities support the potential for such effects (Rogers, Marshment, 2000; TRB, 2014).

Water quality in the ICE Natural Resources Study Area has the potential to be adversely affected by any new growth induced by Alternative A. Induced growth would lead to an increase in impervious surface and the clearing of natural areas particularly around the potential interchange with Soapstone Road, since the area is in a largely rural and forested setting. These actions could indirectly degrade water quality by reducing the ability of affected watersheds to capture precipitation and altering the volume, velocity, and quality of runoff entering surface-water bodies. However, meeting Federal, state, and local regulations addressing stormwater runoff and protecting water quality could reduce potential adverse impacts by reducing the volume of runoff to reduce pollutant loads, treating runoff to reduce pollutant concentration and loads, or a combination of both. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures could be implemented to minimize potential degradation of water quality due to increased impervious surface, drainage alternation, and soil disturbance. In the southern portion of Alternative A, new development could have a beneficial effect on water quality by prompting the replacement of outdated or obsolete drainage infrastructure. Induced growth associated with Alternative A also would have the potential to adversely affect nearby streams, wetlands, floodplains, and wildlife. Since it is unclear how, when, and/or why land would be developed, it is not possible to quantify the scale of either class of effects at this time. However, regardless of their size, extent, or use, any developments which impact surface-water resources would be required to comply with existing Federal and state regulatory controls. Similarly, any Federal or state-sponsored development would be regulated to minimize potential impacts to protected wildlife and wildlife habitat. Potential impacts to Federally protected species on private property are also regulated as previously described. Potential modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. These regulations require avoidance, minimization, and compensatory mitigation.

New construction associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur by:

- demolition, excavation, or vibration effects;
- changing the design, materials, or workmanship; and
- altering the setting, feeling and association of historic properties

Projects funded, permitted, or on lands controlled by Federal and state agencies are required to consider effects on historic properties by complying with Section 106 of the NHPA and the Virginia Antiquities Act and Burial Law, respectively. Additionally, the City of Martinsville's Architectural Review Board assures that changes to contributing structures in the historic districts are made complimentary to its historic fabric. These processes would reduce the potential adverse effects to historic properties from induced growth associated with constructing Alternative A.

Alternative B

Encroachment Effects on Socioeconomic Resources

The potential relocation of 26 residences (nine of which are in EJ block groups) and potential acquisition of 584 acres of right of way would result in properties that were previously not near a major roadway, now being immediately adjacent to the new alignment. Some of these adjacent property owners may choose to leave even though their property is not directly impacted by the project. These secondary relocations could indirectly degrade community cohesion in the long-term. Alternatively, replacement uses, such as commercial or industrial development, could occur in the new front row of properties, especially near the existing and potential interchanges. Additionally, the introduction of new access points and a new roadway could improve travel times for residents located near the new roadway, possibly making those areas more desirable in the long-term.

The construction of Alternative B would redirect regional traffic away from business located on existing Route 220 between Soapstone Road and Route 58. While this may have some adverse impact to local business, traffic modeling indicates that the majority of trips that travel through the length of the corridor do not stop. Therefore, redirecting regional traffic away from Route 220 would have limited adverse effect on local business. Alternatively, reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents. Studies on the impact of bypasses, where a road or highway avoids a built-up area or town to let through traffic flow without local traffic interference, on rural towns and communities support the potential for such effects; however, these studies also indicate that the changes caused by bypasses in the rural environment are minimal (Rogers, Marshment 2000; TRB, 2014).

As currently designed, Alternative B would require the relocation of four industrial properties, the two warehouses located at 1507 Joseph Martin Highway, and the Appalachian Power Company substation, and an unimproved property zoned for industrial use. The relocation of the two warehouses would decrease the supply of industrial space, which could, in turn, increase the relative value of the remaining properties and therefore incentivize the development of additional facilities.

During the consideration of possible indirect effects, it is important to note that this study does not address how existing Route 220 would be managed in the future. Decisions on how the road would be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes that may be implemented along the existing corridor would have a great influence on how the potential indirect effects are realized.

Encroachment Effects on Natural Resources

Water Resources

Construction of Alternative B would require the clearing of approximately 261 acres of forests. This change in land cover would decrease the capacity of the affected watershed to sequester heavy rainfall through evapotranspiration. While the areas converted to roadway would remain unvegetated long-term, vegetation removal and amount of denuded ground surfaces are likely to be highest during construction.

Construction activities such as the use of heavy equipment and staging of materials may also contribute to increased soil compaction. Compacted soils have reduced rates of rainfall infiltration, thus contributing to increased surface runoff. Increased runoff from land-clearing and ground disturbance associated with construction has the potential to introduce additional sediment and nutrients into downstream waters. These added sediments and nutrients can affect the physical and chemical properties of receiving waters. For example, increased sediment loads can reduce water clarity, storage capacity, and quality of habitat in streams, ponds, and wetlands. Increased nutrient loads may lead to eutrophication in water bodies, which can result in low oxygen levels and the proliferation of harmful algae and bacteria. These effects related to construction are expected to be short-term, and proper use of stormwater management and erosion and sediment control measures can reduce the severity of these impacts.

Thermal pollution is also a potential indirect effect on water quality. The removal of 261 acres of forest could lead to more direct exposure of approximately 60 stream reach impacts, associated with Alternative B, to solar radiation. Additionally, common roadway materials absorb heat which can then be transferred to surface runoff flowing across the roadway. An increase in ambient water temperature or pollutants can impair valuable ecological functions by harming aquatic organisms as well as contribute to eutrophication.

Should the construction of the new roadway alignment require streams to be relocated, straightened, piped through culverts, or lined, the change in slope, number and extent of curves, and hydraulic roughness (frictional resistance) could affect the velocity of the water through, and downstream of, the directly impacted sections. Stormwater drainage channels associated with construction and maintenance of the roadway would likely drain into existing streams. Due to high flow velocities often observed through pipes or within hardened channels, there is an increased risk of bed and bank erosion often present at, and/or downstream of, these drainage connections. Other indirect effects of adding hard structures along the stream channels can also include the limitation of the stream's natural ability to move laterally in response to changes within the watershed.

As discussed previously, the permanent removal of vegetation, compaction of soils, and addition of impervious surfaces within the watershed all increase stormwater runoff (VDEQ, 2019b). This runoff often drains into streams and rapidly increases the peak velocity and volume of flow within the channel, commonly referred to as flashiness. Greater velocities are likely to increase erosion along the stream bed and/or banks (VDEQ, 2019b). Erosion or downcutting along the stream bed, known as degradation, can cause a stream to become disconnected from its floodplain. The inability for the stream to access its floodplain often leads to an increased rate of bank erosion, which can impact valuable infrastructure. The clearing of trees and other vegetation in riparian buffers can worsen this risk, as roots provide structural stability to the banks, and above-ground growth provides surface roughness to reduce flow velocities. Stream channels that become deeply incised can also lower the surrounding water table, draining adjacent wetlands and altering the nearby vegetative composition (Rosgen, 1997).

Increased loads of runoff, nutrients, sediment, and chemical pollutants can have long-term effects on the physical, chemical, and biological processes in wetlands. Many wetland plants and animals are adapted to specific hydrologic conditions and could be extirpated if those conditions are altered severely. Alternative B would have the potential to generate additional indirect effects to the wetland areas in proximity to the new alignment through habitat conversion. In this case, habitat conversion refers to changes in the composition of a wetland's plant community that could occur because of changes in the availability of light. In areas where canopy cover would be removed, the increase in light would reduce the competitiveness of woody wetland species that are adapted to shady conditions and support the colonization of the site by more sun-tolerant species. In some cases, the new plant community may be comprised of native species. However, the rapid alteration of environmental conditions brought on by deforestation can facilitate the introduction and expansion of invasive species. An increased presence of invasive species would in turn indirectly affect wetlands by disrupting the ecological process associated with specific native plant species. This change in the biological community, combined with an increased presence of road-sourced water pollutants, could cause wetlands outside of the potential LOD for Alternative B to fail or be negatively altered.

The severity of adverse indirect effects generated by Alternative B on streams, wetlands, and overall water quality can be reduced and/or neutralized through the construction of stormwater management facilities and any mitigation measures determined to be warranted through the regulatory permitting process. In the sections of Alternative B which utilize existing Route 220, the replacement of outdated or obsolete stormwater management facilities with facilities designed to meet more rigorous environmental requirements would reduce the severity of existing impairments caused by highway drainage. Mitigation measures identified during more detailed phases of project development would not only help restore attenuation capacity, but also help restore degraded natural areas.

Alternative B is not projected to impact Beaver Creek or its drainage area. Therefore, the primary source of drinking water for the population within the ICE Natural Resources Study Area would not be degraded by these indirect effects.

<u>Floodplains</u>
Construction of Alternative B could potentially cause indirect effects due to the 13.7 acres of direct impact to 100-year floodplain. These indirect effects could include changing drainage patterns,

water quality degradation, changes in flood flow levels, and associated effects on floral and faunal communities. Fill floodplains would also result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion (FEMA, 2016). However, adequately-sized and properly-placed culverts, bridges, and stormwater BMPs can reduce the severity of, or eliminate, indirect impacts to floodplains by allowing the controlled release and sufficient passage of stormwater.

Wildlife Habitat

The development of Alternative B could indirectly affect the ICE Natural Resources Study Area's wildlife habitat by altering vegetative structure and species composition, expanding highway usage, and altering hydrologic regimes. Alternative B would impact approximately 473 acres of wildlife habitat. The majority of these impacts would occur in the northern section of Alternative B (Reservoir Road to Route 58) where large contiguous blocks of forests would be cleared within the maintained right of way. This would lead to the creation of more open space and edge habitats. The creation of additional edge habitats could indirectly affect the ICE Natural Resources Study Area's forests by creating opportunities for invasive plants to spread, causing habitat conversion, and fragmenting habitats.

Clearing vegetation for the maintained right of way could allow invasive plants to spread into areas that are currently occupied by native species. Many invasive species thrive in disturbed areas where vegetation has been removed and soil exposed. This could result in the expansion of existing colonies (see **Section 3.5**) or the creation of new colonies created through the introduction of invasive species on construction equipment and vehicles. Over time, the increased presence of these colonies of invasive plants could alter the structure and functioning of otherwise unimpacted wildlife areas. A change in the composition of plant species can affect wildlife movement by altering food supply, shelter, or travel corridors due to plant density in the understory.

In some cases, the change in environmental conditions along new forest edges is substantial enough to cause habitat conversion. In the case of forested wetlands, for example, the removal of nearby canopy trees can change light conditions enough that the wetland's shade-tolerant woody plants are replaced with herbaceous plants more adapted to direct sunlight. In the case of the animal communities, habitat conversion at the edges of woodlands can increase the abundance of species which thrive at the margin between grasslands and forests. Examples of these species include white-tailed deer, rabbits, racoons, and opossums. However, other species that are better suited for forest-interior dwelling may not be able to persist. Over time, these effects could reduce the size and diversity of wildlife communities.

Habitat fragmentation occurs when disturbance events, like the construction of a highway or the clearing of land for agriculture, break large and contiguous natural areas into isolated patches. In this case, the construction of a roadway on new alignment fragments habitat by creating new barriers and hazards to animals attempting to reach resources on the other side of the road. Habitat fragmentation can have wide-ranging adverse effects on wildlife, including:

- reduced availability of food sources;
- difficulty finding mates;
- increased pressure from outside predators; and
- the creation of physical barriers to movement and seasonal migration.

Another way the expansion of highway facilities has the potential to indirectly affect the ICE Natural Resources Study Area's wildlife habitat is by increasing the intensity and prevalence of roadway noise. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Such indirect effects could occur where the potential alignment is not utilizing the existing Route 220 corridor.

In addition to the immediate loss of habitat through direct impacts, these disturbances could indirectly affect the ICE Natural Resources Study Areas' wildlife habitats by altering surface-water hydrology. Impacts to streams could indirectly affect wildlife habitats by altering the chemical and physical characteristics of water flowing to downstream communities. Impacts to floodplains and wetlands, as well as an increase in impervious surface coverage could reduce the ability of the affected watershed to attenuate precipitation, and therefore exacerbate stream flashiness and other habitat impairments associated with soil erosion.

The severity of habitat impacts caused by altered hydrology can be reduced by the proper use of erosion and sediment control measures and stormwater management practices. The potential fragmentation of stream habitats directly impacted by the development of Alternative B could be avoided through the use of facilities and structures which preserve stream morphology and hydrologic connectivity. For example, bridges can be used in lieu of culverts or pipes across larger streams. Bridges may also provide areas for wildlife to safely cross beneath the roadway. In smaller streams, countersunk culverts could be used to preserve the structure of the impacted streambeds and therefore provide safe passage for some forms of wildlife.

Construction activities associated with the implementation of Alternative B could potentially result in temporary indirect effects to wildlife habitat. Increased noise, human activity, and dust caused by the operation of heavy machinery, installation of access roads, and staging of building materials could temporarily fragment habitat and displace wildlife. The severity of these effects could be reduced through proper location and minimization of staging areas and construction access roads in valuable habitats. In addition, these effects on wildlife habitat would be temporary as construction activities at any one place are short-term in nature.

<u>Threatened and Endangered Species</u>
Impacts to threatened and endangered species for Alternative B would be similar to the impacts to wildlife habitat discussed in the preceding section, except that the characteristics of many threatened and endangered species tend to render them less resilient when faced with habitat loss/alteration or competition from invasive species.

The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 3-32**). The potential indirect effects of Alternative B on these species are the same as those discussed for wildlife habitat.

For aquatic species listed as threatened or endangered, such as fish and mussels, common threats to their survival include changes in water quality, water turbidity, and stream substrate material. As discussed previously, Alternative B would have the potential to increase runoff. An increase in runoff can lead to additional sediment and pollutants being carried into streams as well as increasing flow velocities, turbidity, and erosion. Any existing habitat or populations of the protected aquatic species within the ICE Natural Resources Study Area could be impacted by these indirect effects.

Bat species within the ICE Natural Resources Study Area for Alternative B could be indirectly affected by the clearing of trees; increase in traffic, noise, and lights; and construction of bridges. Bat species such as the northern long-eared bat and little brown bat often use trees that are hollow or have shaggy bark for roosting during part of the year (NatureServe Explorer, 2019b). Increased noise and light associated with motor vehicle traffic may also dissuade bats from roosting in the areas adjacent to the roadway. However, bats will also occasionally roost beneath bridges for part of the year (NatureServe Explorer, 2019b). Construction of new bridges may provide additional roosting habitat for protected bat species.

The loggerhead shrike is a protected predatory bird species. The shrike prefers open fields and grasslands to forage (NatureServe Explorer, 2019c). Conversion of forests to open areas for roadway construction may provide suitable foraging habitat if the vegetation is not regularly maintained. Conversion of existing grasslands or open fields to roadways could potentially have adverse effects on the loggerhead shrike by reducing the area of suitable foraging habitat.

Protected plant species, such as the smooth coneflower, often require very specific conditions in order to survive. Changes in sunlight exposure, grazing pressure, vegetative competition, and soil moisture can impact the coneflower. The coneflower prefers areas with at least partial exposure to sunlight and is occasionally found along roadsides due to the break in the tree canopy (NatureServe Explorer, 2019d). Construction of a road on new alignment could potentially create or improve conditions suitable for the smooth coneflower by reducing the amount of tree cover and reducing the vegetative competition. However, it may indirectly have an effect to any existing habitat or populations through alteration of wildlife movement and grazing pressure, changes in surface hydrology, and invasive species colonization.

Should any improvements from the Martinsville Southern Connector Study advance to detailed design, refinements would avoid and minimize impacts to habitats associated with rare, threatened, and endangered species as well as the overall limit of disturbance.

Encroachment Effects on Historic Resources

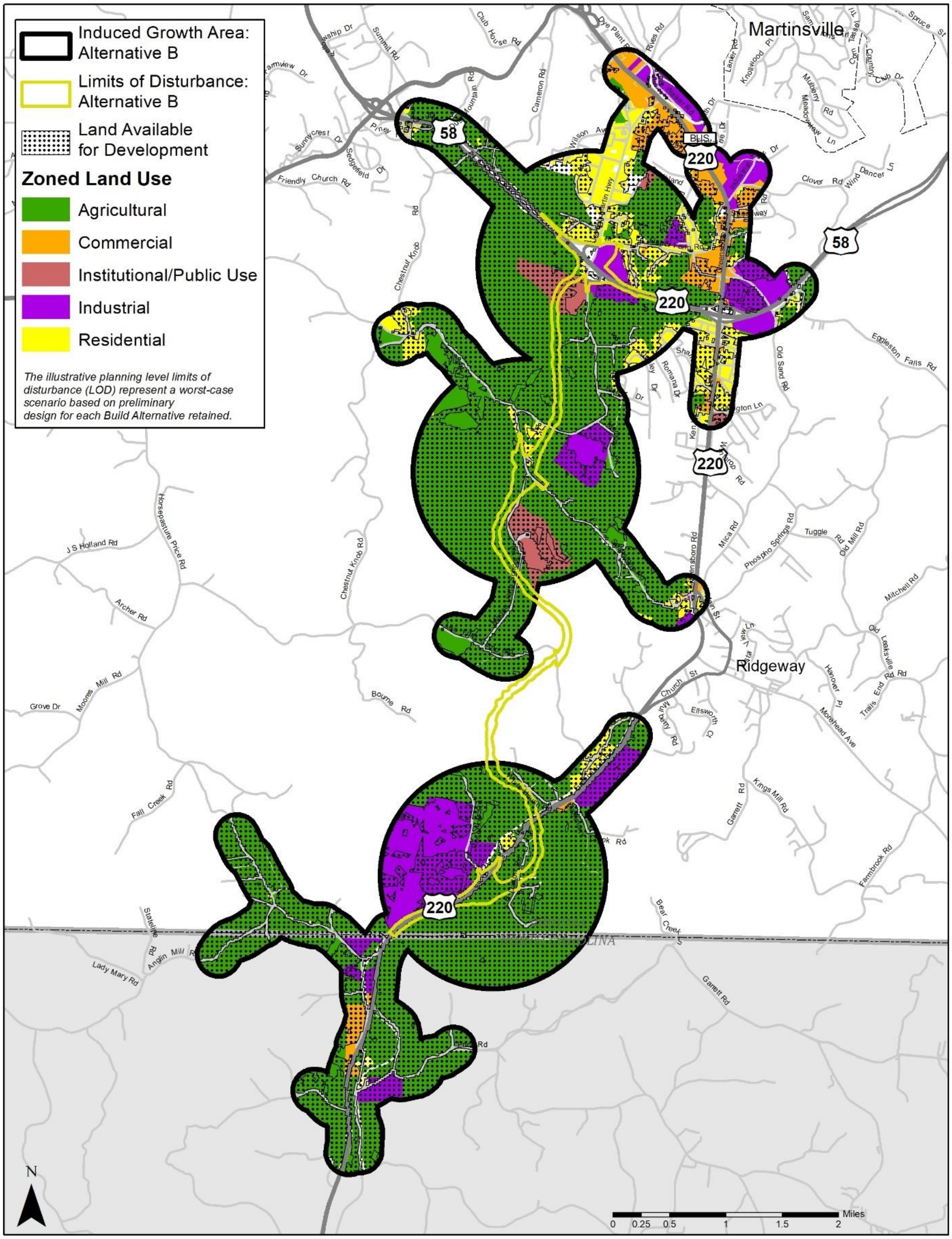
Five architectural historic properties are located within the direct or indirect effects APE for Alternative B. During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short-term and therefore minor. Based upon the direct and/or indirect effects, Alternative B would have the potential to adversely affect two historic resources and/or impact their NRHP eligibility.

Induced Growth Effects

Induced growth could occur with the implementation of Alternative B because it would introduce a new roadway, shift regional traffic, and create new highway access points. To estimate the potential for induced growth, land available for development (identified by NLCD as forests, grasslands, and pastures) was identified (see **Figure 3-23**). The zoning designation was then identified for each mapped parcel. The total acres available for development within each land use zone are summarized in **Table 3-33**.

Based on this methodology, approximately 7,500 acres are available for development within the induced growth area. Approximately 82 percent (6,130 acres) are zoned for agricultural, three percent (191 acres) are zoned for commercial, two percent (177 acres) are zoned for institutional/public use, seven percent (520 acres) are zoned for industrial, and six percent (435 acres) are zoned for residential land use. The potential for development would be greatest in areas proximate to other developed areas, especially for those areas that already have utilities available. The extent, intensity, and character of the new development is unclear at this time; many factors that operate beyond the scope of this study (*e.g.* local development policies and incentives, favorable economic conditions, and ease of financing) would influence development outcomes. However, considering the existing land cover, it is reasonable to conclude that any induced growth that does occur would likely involve the clearing of land rather than infill or redevelopment.

Figure 3-23: Alternative B Induced Growth Area - Zoned Land Use



Additionally, since limited growth has occurred over the last ten to 20 years, rapid growth in the area is not anticipated. Should new development occur, the tax base would increase and would serve as funding for the increased demand on existing community facilities.

Although approximately one-quarter of the Induced Growth Study Area for Alternative B is located within EJ census block groups, the effect to the existing housing stock should be minimal since 435 acres of land available for development are zoned for residential. These parcels, as well as the 6,130 acres of agricultural land, would likely be developed prior to the redevelopment of existing housing stock.

The lands within the Induced Growth Area of Alternative B are covered by two local planning documents: the *Henry County Comprehensive Plan* and the *Rockingham County Land Use Plan* (HCPC, 1995; Rockingham County, 2006). Neither of these documents identify the Martinsville Southern Connector as a future project. However, both identify the Route 220 corridor as an area where growth is expected and desired.

Induced growth could have both beneficial and adverse effects on the ICE Socioeconomic Resources Study Area's economic resources. The conversion of rural lands around the potential interchanges could create opportunities for businesses which require ready access to the highway system and exposure to regional traffic. This development would, in turn, create employment opportunities and generally increase the local demand for labor.

There is also the possibility that commercial development around the new interchanges and the rerouting of regional traffic could reduce the viability of the commercial properties located on Route 220 between Reservoir Road and Route 58 that rely on exposure to regional traffic. The severity and immediacy of this effect is constrained by the time required to construct a similar density and diversity of services along the potential alignment. Another mitigating factor is the preservation of the Route 220/Route 58 interchange. This interchange would still provide the existing businesses easy access to the highway system and the regional traffic. Additionally, the reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents.

Water quality in the ICE Natural Resources Study Area has the potential to be adversely affected by any new growth induced by Alternative B. Induced growth would lead to an increase in impervious surface and the clearing of natural areas particularly around the potential interchange with Soapstone Road, since the area is a largely rural and forested setting. These actions could indirectly degrade water quality by reducing the ability of affected watersheds to capture precipitation and altering the volume, velocity, and quality of runoff entering surface-water bodies. However, meeting Federal, state, and local regulations addressing stormwater runoff and protecting water quality could reduce potential adverse impacts by reducing the volume of runoff to reduce pollutant loads, treating runoff to reduce pollutant concentration and loads, or a combination of both. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures could be implemented to minimize potential degradation of water quality due to increased impervious surface, drainage alternation, and soil disturbance. In the southern portion of Alternative B, new development could have a beneficial effect on water quality by prompting the replacement of outdated or obsolete drainage infrastructure. Induced growth associated with Alternative B also would have the potential to adversely affect nearby streams, wetlands, floodplains, and wildlife. Since it is unclear how, when, and/or why land would be developed, it is not possible to quantify the scale of either class of effects at this time. However, regardless of their size, extent, or use, any developments which impact surface-water resources would be required to comply with existing Federal and state regulatory controls. Similarly, any Federal or state-sponsored development would be regulated to minimize potential impacts to protected wildlife and wildlife habitat. Potential impacts to Federally protected species on private property are also regulated as previously described. Potential modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. These regulations require avoidance, minimization, and compensatory mitigation.

New construction associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur by:

- demolition, excavation, or vibration effects;
- changing the design, materials, or workmanship; and
- altering the setting, feeling and association of historic properties

Projects funded, permitted, or on lands controlled by Federal and state agencies are required to consider effects on historic properties by complying with Section 106 of the NHPA and the Virginia Antiquities Act and Burial Law, respectively. Additionally, the City of Martinsville's Architectural Review Board assures that changes to contributing structures in the historic districts are made complimentary to its historic fabric. These processes would reduce the potential adverse effects to historic properties from induced growth associated with constructing Alternative B.

Alternative C (Preferred Alternative)

Encroachment Effects on Socioeconomic Resources
The relocation of 25 residences (nine of which are in EJ block groups) and potential acquisition of 541 acres of right of way would result in properties that were previously not near a major roadway, now being immediately adjacent to the new alignment. Some of these adjacent property owners may choose to leave even though their property is not directly impacted by the alternative. These secondary relocations could indirectly degrade community cohesion in the long-term. This indirect effect would affect both EJ and non-EJ communities. Alternatively, replacement uses, such as commercial or industrial development, could occur in the new front row of properties, especially near the existing and potential interchanges. Additionally, the introduction of new access points and a new roadway could improve travel times for residents located near the new roadway, possibly making those areas more desirable in the long-term.

The construction of Alternative C could redirect regional traffic away from business located on existing Route 220 between Soapstone Road and Route 58. While this may have some adverse impact to local business, traffic modeling indicates that the majority of trips that travel through the length of the corridor do not stop. Therefore, redirecting regional traffic away from Route 220 would have limited adverse effect on local business. Alternatively, reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents. Studies on the impact of bypasses on rural towns and communities support the potential for such effects; however, these studies also indicate that the changes caused by bypasses, where a road or highway avoids a built-up area or town to let through traffic flow without local traffic interference, in the rural environment are minimal (Rogers, Marshment 2000; TRB, 2014).

As currently designed, Alternative C would require the relocation of three industrial properties, the two warehouses located at 1507 Joseph Martin Highway, and the Appalachian Power Company substation. The relocation of the two warehouses would decrease the supply of industrial space, which could, in turn, increase the relative value of the remaining properties and therefore incentivize the development of additional facilities.

During the consideration of possible indirect effects, it is important to note that this study does not address how existing Route 220 would be managed in the future. Decisions on how the road would be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes that may be implemented along the existing corridor would have a great influence on how the potential indirect effects are realized.

Encroachment Effects on Natural Resources

Water Resources
Construction of Alternative C would require the clearing of approximately 224 acres of forests. This change in land cover would decrease the capacity of the affected watershed to sequester heavy rainfall through evapotranspiration. While the areas converted to roadway would remain unvegetated long-term, vegetation removal and amount of denuded ground surfaces are likely to be highest during construction.

Construction activities such as the use of heavy equipment and staging of materials may also contribute to increased soil compaction. Compacted soils have reduced rates of rainfall infiltration, thus contributing to increased surface runoff. Increased runoff from land-clearing and ground disturbance associated with construction has the potential to introduce additional sediment and nutrients into downstream waters. These added sediments and nutrients can affect the physical and chemical properties of receiving waters. For example, increased sediment loads can reduce water clarity, storage capacity, and quality of habitat in streams, ponds, and wetlands. Increased nutrient loads may lead to eutrophication in water bodies, which can result in low oxygen levels and the proliferation of harmful algae and bacteria. These effects related to construction are expected to be short-term, and proper use of stormwater management and erosion and sediment control measures can reduce the severity of these impacts.

Thermal pollution is also a potential indirect effect on water quality. The removal of 224 acres of forest could lead to more direct exposure of approximately 60 stream reach impacts, associated with Alternative C, to solar radiation. Additionally, common roadway materials absorb heat which can then be transferred to surface runoff flowing across the roadway. An increase in ambient water temperature or pollutants can impair valuable ecological functions by harming aquatic organisms as well as contribute to eutrophication.

Should the construction of the new roadway alignment require streams to be relocated, straightened, piped through culverts, or lined, the change in slope, number and extent of curves, and hydraulic roughness (frictional resistance) could affect the velocity of the water through, and downstream of, the directly-impacted sections. Stormwater drainage channels associated with construction and maintenance of the roadway would likely drain into existing streams. Due to high flow velocities often observed through pipes or within hardened channels, there is an increased risk of bed and bank erosion often present at, and/or downstream of, these drainage connections. Other indirect effects of adding hard structures along the stream channels can also include the limitation of the stream’s natural ability to move laterally in response to changes within the watershed.

As discussed previously, the permanent removal of vegetation, compaction of soils, and addition of impervious surfaces within the watershed all increase stormwater runoff (VDEQ, 2019b). This runoff often drains into streams and rapidly increases the peak velocity and volume of flow within the channel, commonly referred to as flashiness. Greater velocities are likely to increase erosion along the stream bed and/or banks (VDEQ, 2019b). Erosion or downcutting along the stream bed, known as degradation, can cause a stream to become disconnected from its floodplain. The inability for the stream to access its floodplain often leads to an increased rate of bank erosion, which can impact valuable infrastructure. The clearing of trees and other vegetation in riparian buffers can worsen this risk, as roots provide structural stability to the banks, and above-ground growth provides surface roughness to reduce flow velocities. Stream channels that become deeply incised can also lower the surrounding water table, draining adjacent wetlands and altering the nearby vegetative composition (Rosgen, 1997).

Increased loads of runoff, nutrients, sediment, and chemical pollutants can have long-term effects on the physical, chemical, and biological processes in wetlands. Many wetland plants and animals are adapted to specific hydrologic conditions and could be extirpated if those conditions are altered severely. Alternative C would have the potential to generate additional indirect effects to the wetland areas in proximity to the new alignment through habitat conversion. In this case, habitat conversion refers to changes in the composition of a wetland's plant community that could occur because of changes in the availability of light. In areas where canopy cover would be removed, the increase in light would reduce the competitiveness of woody wetland species that are adapted to shady conditions and support the colonization of the site by more sun-tolerant species. In some cases, the new plant community may be comprised of native species. However, the rapid alteration of environmental conditions brought on by deforestation can facilitate the introduction and expansion of invasive species. An increased presence of invasive species would in turn indirectly affect wetlands by disrupting the ecological process associated with specific native plant species. This change in the biological community, combined with an increased presence of road-sourced water pollutants, could cause wetlands outside of the potential LOD of Alternative C to fail or be negatively altered.

The severity of adverse indirect effects generated by Alternative C on streams, wetlands, and overall water quality can be reduced and/or neutralized through the construction of stormwater management facilities and any mitigation measures determined to be warranted through the regulatory permitting process. In the southern section of Alternative C (from the Virginia-North Carolina state line to Reservoir Road), the replacement of outdated or obsolete stormwater management facilities with facilities designed to meet more rigorous environmental requirements would reduce the severity of existing impairments caused by highway drainage. Mitigation measures identified during more detailed phases of project development would not only help restore attenuation capacity, but also help restore degraded natural areas.

<u>Floodplains</u>

Construction of Alternative C could potentially cause indirect effects due to the 7.5 acres of direct impact to 100-year floodplain. These indirect effects could include changing drainage patterns, water quality degradation, changes in flood flow levels, and associated effects on floral and faunal communities. Fill floodplains would also result in loss of floodplain functions. Floodplain encroachment could alter the hydrology of the floodplain that could indirectly result in more severe flooding in terms of flood height, duration, and erosion (FEMA, 2016). However, adequately sized and properly-placed culverts, bridges, and stormwater BMPs can reduce the severity of, or eliminate, indirect impacts to floodplains by allowing the controlled release and sufficient passage of stormwater.

<u>Wildlife Habitat</u>

The development of Alternative C could indirectly affect the ICE Natural Resources Study Area's wildlife habitat by altering vegetative structure and species composition, expanding highway usage, and altering hydrologic regimes. Alternative A would impact approximately 441 acres of wildlife habitat. The majority of these impacts to forests would occur in the northern section of Alternative C (Reservoir Road to Route 58) where large contiguous blocks of forests would be cleared within the maintained right of way. This would lead to the creation of more open space and edge habitats. The creation of additional edge habitats could indirectly affect the ICE Natural Resources Study Area's forests by creating opportunities for invasive plants to spread, causing habitat conversion, and fragmenting habitats.

Clearing vegetation for the maintained right of way could allow invasive plants to spread into areas that are currently occupied by native species. Many invasive species thrive in disturbed areas where vegetation has been removed and soil exposed. This could result in the expansion of existing colonies or the creation of new colonies created through the introduction of invasive species on construction equipment and vehicles. Over time, the increased presence of these colonies of invasive plants could alter the structure and functioning of otherwise unimpacted wildlife areas. A change in the composition of plant species can affect wildlife movement by altering food supply, shelter, or travel corridors due to plant density in the understory.

In some cases, the change in environmental conditions along new forest edges is substantial enough to cause habitat conversion. In the case of forested wetlands, for example, the removal of nearby canopy trees can change light conditions enough that the wetland's shade-tolerant woody plants are replaced with herbaceous plants more adapted to direct sunlight. In the case of the animal communities, habitat conversion at the edges of woodlands can increase the abundance of species which thrive at the margin between grasslands and forests. Examples of these species include white-tailed deer, rabbits, racoons, and opossums. However, other species that are better suited for forest-interior dwelling may not be able to persist. Over time, these effects could reduce the size and diversity of wildlife communities.

Habitat fragmentation occurs when disturbance events, like the construction of a highway or the clearing of land for agriculture, break large and contiguous natural areas into isolated patches. In this case, the construction of a roadway on new alignment fragments habitat by creating new barriers and hazards to animals attempting to reach resources on the other side of the road. Habitat fragmentation can have wide-ranging adverse effects on wildlife, including:

- reduced availability of food sources;
- difficulty finding mates;
- increased pressure from outside predators;
- the creation of physical barriers to movement and seasonal migration.

Another way the expansion of highway facilities has the potential to indirectly affect the ICE Natural Resources Study Area's wildlife habitat is by increasing the intensity and prevalence of roadway noise. Roadway noise can result in altered habitat utilization, strained communication, and heightened metabolic rates on wildlife, especially avian communities, indirectly causing wildlife abandonment of the area, increased predation, reduced foraging success, decreased breeding success, and decreased wildlife health. Such indirect effects could occur where the potential alignment is not utilizing the existing Route 220 corridor.

In addition to the immediate loss of habitat through direct impacts, these disturbances could indirectly affect the ICE Natural Resources Study Areas' wildlife habitats by altering surface-water hydrology. Impacts to streams could indirectly affect wildlife habitats by altering the chemical and physical characteristics of water flowing to downstream communities. Impacts to floodplains and wetlands, as well as an increase in impervious surface coverage could reduce the ability of the affected watershed to attenuate precipitation, and therefore exacerbate stream flashiness and other habitat impairments associated with soil erosion.

The severity of habitat impacts caused by altered hydrology can be reduced by the proper use of erosion and sediment control measures and stormwater management practices. The potential fragmentation of stream habitats directly impacted by the development of Alternative C could be avoided through the use of facilities and structures which preserve stream morphology and hydrologic connectivity. For example, bridges can be used in lieu of culverts or pipes across larger streams. Bridges may also provide areas for wildlife to safely cross beneath the roadway. In smaller streams, countersunk culverts could be used to preserve the structure of the impacted streambeds and therefore provide safe passage for some forms of wildlife.

Construction activities associated with the implementation of Alternative C could potentially result in temporary indirect effects to wildlife habitat. Increased noise, human activity, and dust caused by the operation of heavy machinery, installation of access roads, and staging of building materials could temporarily fragment habitat and displace wildlife. The severity of these effects could be reduced through proper location and minimization of staging areas and construction access roads in valuable habitats. In addition, these effects on wildlife habitat would be temporary as construction activities at any one place are short-term in nature.

Threatened and Endangered Species

Impacts to threatened and endangered species for Alternative C would be similar to the impacts to wildlife habitat discussed in the preceding section, except that the characteristics of many threatened and endangered Species tend to render them less resilient when faced with habitat loss/alteration or competition from invasive species.

The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 3-32**). The potential indirect effects of Alternative C on these species are the same as those discussed for wildlife habitat.

For aquatic species listed as threatened or endangered, such as fish and mussels, common threats to their survival include changes in water quality, water turbidity, and stream substrate material. As discussed previously, Alternative C would have the potential to increase runoff. An increase in runoff can lead to additional sediment and pollutants being carried into streams as well as increasing flow velocities, turbidity, and erosion. Any existing habitat or populations of the protected aquatic species within the ICE Natural Resources Study Area could be adversely impacted by these indirect effects.

Bat species within the ICE Natural Resources Study Area for Alternative C could be indirectly affected by the clearing of trees; increase in traffic, noise, and lights; and construction of bridges. Bat species such as the northern long-eared bat and little brown bat often use trees that are hollow or have shaggy bark for roosting during part of the year (NatureServe Explorer, 2019b). Increased noise and light associated with motor vehicle traffic may also dissuade bats from roosting in the areas adjacent to the roadway. However, bats will also occasionally roost beneath bridges for part of the year (NatureServe Explorer, 2019b). Construction of new bridges may provide additional roosting habitat for protected bat species.

The loggerhead shrike is a protected predatory bird species. The shrike prefers open fields and grasslands to forage (NatureServe Explorer, 2019c). Conversion of forests to open areas for roadway construction may provide suitable foraging habitat if the vegetation is not regularly maintained. Conversion of existing grasslands or open fields to roadways could potentially have an effect on the loggerhead shrike by reducing the area of suitable foraging habitat.

Protected plant species, such as the smooth coneflower, often require very specific conditions in order to survive. Changes in sunlight exposure, grazing pressure, vegetative competition, and soil moisture can impact the coneflower. The coneflower prefers areas with at least partial exposure to sunlight and is occasionally found along roadsides due to the break in the tree canopy (NatureServe Explorer, 2019d). Construction of a road on new alignment could potentially create or improve conditions suitable for the smooth coneflower by reducing the amount of tree cover and reducing the vegetative competition. However, it may indirectly have an effect to any existing habitat or populations through alteration of wildlife movement and grazing pressure, changes in surface hydrology, and invasive species colonization.

Should any improvements from the Martinsville Southern Connector Study advance to detailed design, refinements would avoid and minimize impacts to habitats associated with rare, threatened, and endangered species as well as the overall limit of disturbance.

Encroachment Effects on Historic Resources

Three architectural historic properties are located within the direct or indirect effects APE for Alternative C. During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short term and therefore minor. The indirect effects are not anticipated to be substantial enough to alter the use of these historic resources or to impact their NRHP eligibility.

Induced Growth Effects

Induced growth could occur with the implementation of Alternative C because it would introduce a new roadway, shift regional traffic, and create new access points. To estimate the potential for induced growth, land available for development (identified by NLCD as forests, grasslands, and pastures) was identified (see **Figure 3-24**). The zoning designation was then identified for each mapped parcel. The total acres available for development within each land use zone are summarized in **Table 3-33**.

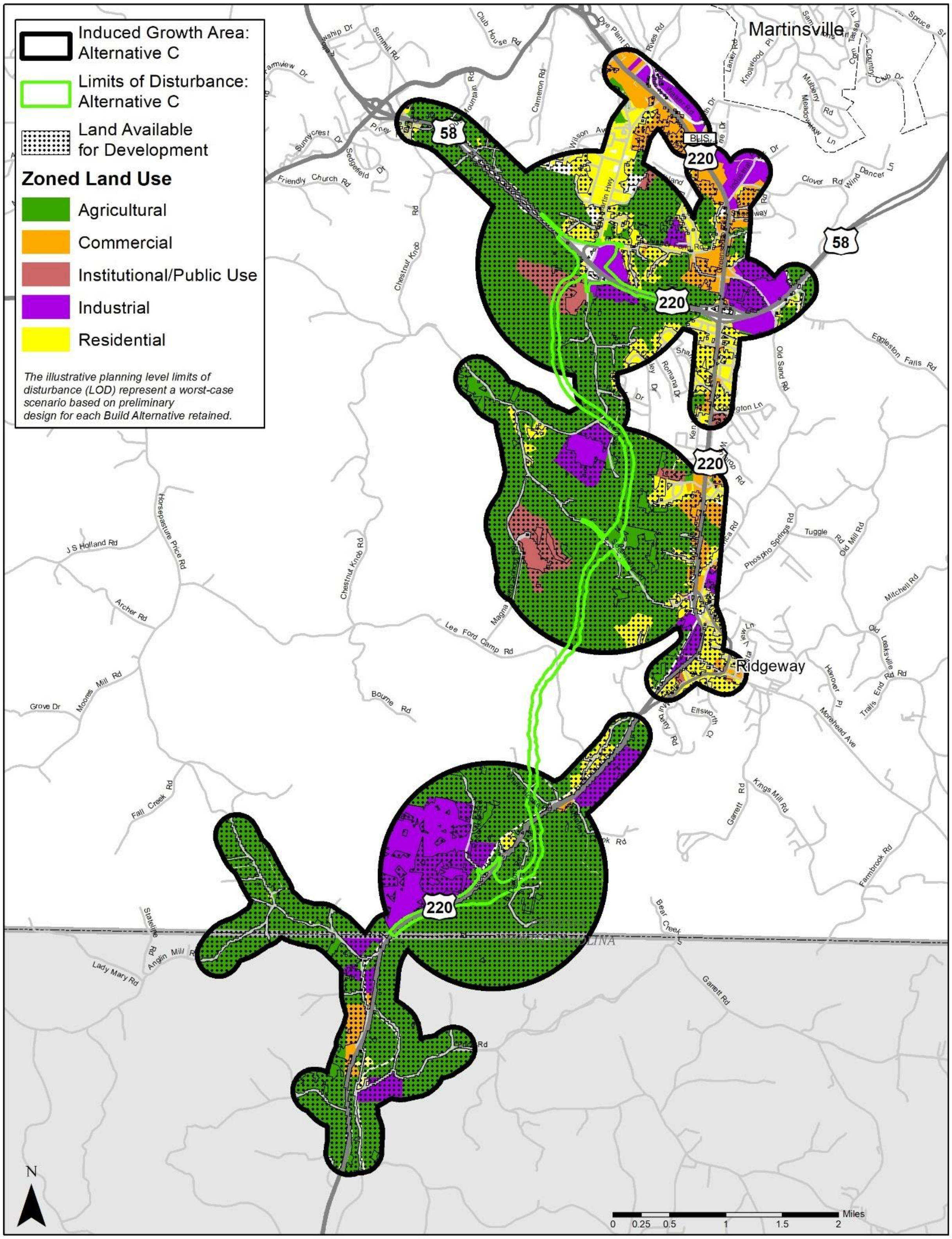
Based on this methodology, approximately 7,200 acres are available for development within the induced growth area. Approximately 79 percent (5,723 acres) are zoned for agricultural, four percent (258 acres) are zoned for commercial, three percent (190 acres) are zoned for institutional/public use, seven percent (494 acres) are zoned for industrial, and eight percent (554 acres) are zoned for residential land use. The potential for development would be greatest in areas proximate to other developed areas, especially for those areas that already have utilities available. The extent, intensity, and character of the new development is unclear at this time; many factors that operate beyond the scope of this study (*e.g.* local development policies and incentives, favorable economic conditions, and ease of financing) would influence development outcomes. However, considering the existing land cover, it is reasonable to conclude that any induced growth that does occur would likely involve the clearing of land rather than infill or redevelopment. Additionally, since limited growth has occurred over the last ten to 20 years, rapid growth in the area is not anticipated. Should new development occur, the tax base would increase and would serve as funding for the increased demand on existing community facilities.

Although approximately one-quarter of the Induced Growth Study Area for Alternative C is located within EJ census block groups, the effect to the existing housing stock should be minimal since 554 acres of land available for development are zoned for residential. These parcels, as well as the 5,723 acres of agricultural land, would likely be developed prior to the redevelopment of existing housing stock.

The lands within the Induced Growth Area of Alternative C are covered by two local planning documents: the *Henry County Comprehensive Plan* and the *Rockingham County Land Use Plan* (HCPC, 1995; Rockingham County, 2006). Neither of these documents identify the Martinsville Southern Connector as a future project. However, both identify the Route 220 corridor as an area where growth is expected and desired.

Induced growth could have both beneficial and adverse effects on the ICE Socioeconomic Resources Study Area's economic resources. The potential conversion of rural lands around the potential interchanges could create opportunities for businesses which require ready access to the highway system and exposure to regional traffic. This development would, in turn, create employment opportunities and generally increase the local demand for labor.

Figure 3-24: Alternative C Induced Growth Area - Zoned Land Use



There is also the possibility that commercial development around the new interchanges and the rerouting of regional traffic could reduce the viability of the commercial properties located on Route 220 between Reservoir Road and Route 58 that rely on exposure to regional traffic. The severity and immediacy of this effect is constrained by the time required to construct a similar density and diversity of services along the potential alignment. Another mitigating factor is the preservation of the Route 220/Route 58 interchange. This interchange would still provide the existing businesses easy access to the highway system and the regional traffic that it bears. Additionally, the reduction of traffic, including trucks, could make the businesses along Route 220 more accessible and desirable to current and potential residents.

Water quality in the ICE Natural Resources Study Area has the potential to be adversely affected by any new growth induced by Alternative A. Induced growth would lead to an increase in impervious surface and the clearing of natural areas particularly around the potential interchange with Soapstone Road, since the area is a largely rural and forested setting. These actions could indirectly degrade water quality by reducing the ability of affected watersheds to capture precipitation and altering the volume, velocity, and quality of runoff entering surface-water bodies. However, meeting Federal, state, and local regulations addressing stormwater runoff and protecting water quality could reduce potential adverse impacts by reducing the volume of runoff to reduce pollutant loads, treating runoff to reduce pollutant concentration and loads, or a combination of both. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures could be implemented to minimize potential degradation of water quality due to increased impervious surface, drainage alternation, and soil disturbance. In the southern portion of Alternative C, new development could have a beneficial effect on water quality by prompting the replacement of outdated or obsolete drainage infrastructure. Induced growth associated with Alternative C also would have the potential to adversely affect nearby streams, wetlands, floodplains, and wildlife. Since it is unclear how, when, and/or why land would be developed, it is not possible to quantify the scale of either class of effects at this time. However, regardless of their size, extent, or use, any developments which impact surface-water resources would be required to comply with existing Federal and state regulatory controls. Similarly, any Federal or state-sponsored development would be regulated to minimize potential impacts to protected wildlife and wildlife habitat. Potential impacts to Federally protected species on private property are also regulated as previously described. Potential modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. These regulations require avoidance, minimization, and compensatory mitigation.

New construction associated with induced growth has the potential to adversely affect archaeological and architectural historic properties. This could occur by:

- demolition, excavation, or vibration effects;
- changing the design, materials, or workmanship; and
- altering the setting, feeling and association of historic properties

Projects funded, permitted, or on lands controlled by Federal and state agencies are required to consider effects on historic properties by complying with Section 106 of the NHPA and the Virginia Antiquities Act and Burial Law, respectively. Additionally, the City of Martinsville's Architectural Review Board assures that changes to contributing structures in the historic districts are made complimentary to its historic fabric. These processes would reduce the potential adverse effects to historic properties from induced growth associated with constructing Alternative C.

3.13.2.6 Step 7: Assess Consequences and Develop Mitigation

No-Build Alternative

Under the No-Build Alternative, no improvements within the ICE Study Areas would occur other than routine maintenance to existing facilities. This would result in continued conflicts between regional and local traffic. Over time, this could result in impacts to community cohesion and loss of business and employment in the ICE Socioeconomic Resources Study Area. The lack of improvements to the roadway network could indirectly effect the ability of visitors to access historic properties within the ICE Historic Resources Study Area. With continued use of Route 220 as the area's primary road for regional and freight traffic, pollutants associated with automotive travel would continue to enter nearby water bodies via surface runoff. Existing development within the watersheds would continue to contribute to surface water impairments.

No induced growth is expected under the No-Build Alternative, as no new interchanges or access points would be constructed. While much of the area surrounding Route 220 is already developed, planned and/or approved for development (such as the Commonwealth Crossing Business Centre), or is zoned to allow development, the increase in truck and passenger car volumes along Route 220, with no associated improvements, could affect the desirability of developing in this area. As this alternative is the baseline against which the Build Alternatives are compared to assess environmental effects, no mitigation measures are necessary for the No-Build Alternative.

Alternatives A, B, and C

Socioeconomic Resources

Alternatives A, B, and C could result in the development of land in the vicinity of the new interchanges, and along the approach roads to these interchanges. Henry County, Martinsville, and Rockingham County identify the Route 220 corridor as an area where growth is expected and desired, and all of the localities have noted in their comprehensive plans that redevelopment and new development is planned and likely to occur; therefore, it would not change the overall existing and planned land use pattern in Henry County, Martinsville, or Rockingham County. To manage this potential growth, the localities would be advised to review their zoning and community plans to ensure that they encourage potential growth in the desired locations.

While the construction of a new alignment has the potential to cause a loss in sales to businesses along Route 220, the potential for new business growth in the vicinity of the interchanges could increase business sales in the area. To avoid or minimize the reduction in sales to businesses along Route 220, VDOT would coordinate with the localities about how the road should be signed (business route or local road), the type of information that would be provided to drivers (information on businesses along the route), and the type of geometric changes.

Natural Resources

Water Resources

Traffic could indirectly impact water quality through spills and vehicular deposition of pollutants such as heavy metals, asbestos, and petroleum products and their byproducts. In the event of a spill, VDOT would support first responders and emergency management efforts, as necessary, to reduce direct and indirect effects to surface waters. Implementation of strict erosion and sediment control measures during construction would reduce temporary indirect impacts to surface waters. Modern temporary and permanent stormwater management measures, including stormwater management ponds, sediment basins, vegetative controls, and other measures would be implemented to minimize potential degradation of water quality due to increased impervious surface, drainage alteration, as well as soil and vegetation disturbance. These measures would reduce or detain discharge volumes and remove many pollutants before discharging into receiving bodies of water. All VDOT projects on state-owned lands are required to comply with the Virginia

Erosion & Sediment Control (ESC) Law and Regulations, the Virginia Stormwater Management (SWM) Law and Regulations, the most current version of the VDOT Annual ESC and SWM Specifications and Standards, and the project-specific ESC and SWM plans, as well as any other permit conditions, as applicable.

VDOT's practice is generally to maintain both water quality and quantity post-development equal to or better than pre-development, as described in current guidance, Minimum Requirements for the Engineering, Plan Preparation and Implementation of Post Development Stormwater Management Plans (Instructional and Informational Memorandum Number: IIM-LD-195.8, VDOT – Location and Design Division). Impacts to water quality from contaminant loadings would be reduced through highway design that incorporates runoff pre-treatment, including vegetated medians and swales, stormwater BMPs, and forebays (basins designed to detain the runoff for initial settling of coarse particulates). Development in any induced growth areas would be subject to the same erosion and sediment control as described above, or equivalent North Carolina regulations for any induced growth within that state. Modifications to wetlands, streams, and floodplains that may occur because of induced growth would be minimized by Federal and state regulations governing construction impacts to Waters of the US. Unavoidable impacts to wetlands and streams would require mitigation by the project sponsor in accordance with the 2008 final Federal regulations entitled *Compensatory Mitigation for Losses of Aquatic Resources; Final Rule* (33 CFR §325 and 332; 40 CFR §230).

<u>Floodplains</u>
Potential indirect effects to floodplains from any of the Alternatives would be minimized by adherence to regulations governing construction impacts to floodplains. These regulations require avoidance, minimization, and compensatory mitigation. Design modifications to eliminate or minimize floodplain encroachments to the extent practicable are required by EO 11988: Floodplain Management. Implementation of strict erosion and sediment control measures during construction would minimize temporary impacts to floodplains. Development due to induced growth could be subject to the same regulations.

All roadway construction would utilize structures designed to adequately pass design floods and accommodate passage of aquatic organisms. Realignment, proper resizing, and replacement of existing culverts can reduce overall current stream quality degradation by improving locations where the roadway would intersect a floodplain. Design and construction techniques that reduce water quality impacts and protect aquatic species, as described in the Virginia Stormwater Management BMP Clearinghouse, would be incorporated into construction and maintenance of each of the Alternatives.

During more detailed phases of project development, a hydrologic and hydraulic analysis would be conducted to ensure adequate design of the hydraulic openings of culverts and bridges, allowing proper conveyance of floodwaters and minimizing potential indirect impacts to floodplains and floodplain hazards. The design would ensure that no substantial increase in downstream flooding would occur and/or would document the need for any LOMR or CLOMR and that all encroachments would conform with all applicable state and local floodplain protection standards.

<u>Wildlife Habitat</u>
The indirect effects to wildlife from habitat loss, fragmentation, and degradation due to reduced water quality or altered hydrology associated with the Alternatives should be minimized and mitigated by the measures discussed above for water resources. Design modifications to stream crossings mindful of maintaining natural stream bottoms, such as countersinking culverts and using bridges, would be incorporated to reduce adverse indirect effects to aquatic wildlife. Using bridges for crossings of streams and associated riparian corridors can also provide habitat connection and allow for safe overland wildlife movement. Preliminary designs at this stage of the

study do not incorporate details regarding these bridges and pipe culverts. These measures would be fully considered during design and permitting.

Temporary construction impacts to fish and macroinvertebrates would be reduced through appropriate use of temporary stream crossing structures and strict adherence to erosion and sedimentation controls. Temporary impacts would also be reduced through proper location and minimization of staging areas and avoidance of construction access roads in valuable habitats whenever possible. Minimizing roadway cut/fill footprint as well as the median width can reduce both direct and indirect effects on aquatic and terrestrial wildlife habitat. Restricting the timing and duration of some construction activities relative to specific species needs would also minimize potential indirect effects to wildlife feeding, migration, breeding, nesting, and spawning. Post-construction plantings with native species that are present along the Preferred Alternative corridor can help minimize habitat loss. In some cases, habitat restoration in areas that are currently disturbed along the alignment can mitigate for direct and indirect impacts associated with roadway construction.

In keeping with the requirements of EO 13112: *Invasive Species*, invasive plant species management techniques would be used to minimize any indirect effects to wildlife and wildlife habitat from the introduction and spread of invasive species that may occur as a result of the construction of any of the Alternatives. VDOT's *Roadside Development Specification 244* and *Roadside Vegetation Management Policy* includes these and other measures to manage invasive plant species. These provisions require prompt seeding of disturbed areas with mixes that are tested in accordance with the Virginia Seed Law and VDOT's standards and specifications to ensure that seed mixes are free of noxious species. To prevent the introduction and establishment of invasive species during construction, the contractor would be required to adhere to VDOT's *Road and Bridge Specifications Manual*, Chapter 40 of Title 3.2 of the Code of Virginia, Virginia Administrative Code (VAC) 2VAC-5-390-20, and other applicable regulations.

<u>Threatened and Endangered Species</u>
Based on completed habitat assessments, field surveys, desktop review, and agency coordination, the Build Alternatives are not likely to directly impact threatened and endangered species. However, Alternatives A, B, and C would result in the denuding of forested and currently undeveloped lands, and thus would have the potential to indirectly affect these species. Potential indirect impacts to threatened and endangered species could be minimized through the design measures and construction practices discussed above for protection of water resources, floodplains, and wildlife habitat.

Additional coordination with VDGIF and USFWS would occur prior to construction in the advanced stages of the project design, at which point any necessary mitigation measures would be further developed. Through the consultation process under the Endangered Species Act, indirect effects are considered and appropriate mitigation measures identified. Consultation would occur before the permit decision, as any mitigation measures, conditions, or restrictions determined necessary by USFWS would be included by regulatory agencies as conditions of any permit issued. Mitigation measures may include the use of time-of-year restrictions on construction; contractor training in recognizing and avoiding threatened and endangered species and their habitats; or restoration of habitat. Potential impacts that may result from induced growth would be regulated by the agencies mentioned above, or the North Carolina Wildlife Resources Commission and North Carolina Department of Agriculture Plant Conservation Program for any future development in that state.

<u>Historic Resources</u>
During construction, access to historic properties could be temporarily impacted by temporary road closures, detours, and loss of parking, potentially affecting visitation. However, any change

in access or parking would be mitigated through appropriate construction signage to allow for detours or alternative parking areas. These construction effects would be short-term and therefore minor. The indirect effects are not anticipated to be substantial enough to alter the use of these historic resources or to impact their NRHP eligibility.

3.13.3 Cumulative Effects Analysis

3.13.3.1 What is the Geographic Area and Temporal Boundaries Affects by the Study?

The geographic limits for the cumulative effects analysis are the same as the ICE Study Areas described in **Section 3.13.2.2.1**.

The analysis of cumulative effects considers past, present, and reasonably foreseeable future actions. The temporal boundaries that were used for the cumulative effects assessment span from 1926, when Route 220 was constructed as a two-lane roadway, to 2040, the Build Alternative's design year. Infrastructure development and land use trends, such as the emergence of the local textile industry in the 1930s, and the clearing of forests throughout the first half of the 20th century, influenced the function and stability of the ICE Study Areas' notable resources.

3.13.3.2 What are the Resources Affected by the Study?

The resources affected by the Build Alternatives would be the same as those resources identified in **Step 3** of the indirect effects analysis discussed in **Section 3.13.2.3**.

3.13.3.3 What are the Other Past, Present, and Reasonably Foreseeable Future Actions That Have Impacted or May Impact the Resources?

Past Actions

The early 20th century was selected as the starting point for the consideration of past actions. This phase in the ICE Study Areas' history was the point where industrial manufacturing became an important part of the local economy and the historical pattern of agrarian land use began giving way to urban and suburban forms of development. At this point in time, the Martinsville area was transitioning from the tobacco-based economy that supported the region since the Revolutionary War and into one more focused on converting the area's timber resources into furniture, lumber, and related commodities. From a land use perspective, this transition led to the clearing of forests for timber; the conversion of agricultural fields into industrial workshops; and the intensification of development in established centers. Beyond Martinsville, Ridgeway, and the Town of Price in North Carolina, the only social resources shown on the 1924 USGS historical map are places of worship (i.e., churches and chapels) and schools (see Figure A-1 of the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j). The number and distribution of these community facilities suggest that, while Martinsville was beginning to assert itself as an urban center, some aspects of social life still operate at a smaller, more decentralized scale. Some of the notable projects leading up to this period include:

- completion of the Danville & Western Division of the Southern Railway in the 1880s and the Norfolk & Western Railway in the 1890s;
- opening of the Bassett Furniture Company in 1902;
- opening of the Marshall Field & Company (and the founding of Fieldale as the company-town) in 1917;
- construction of the Martinsville Dam on the Smith River in 1924; and
- construction of Route 220 as a two-lane roadway in 1926.

Many of the ICE Natural Resources Study Area's notable streams can be seen on the 1924 USGS historical map, including the Smith River, Stillhouse Run, and Surry Martin Branch. Towns, roadways, and railways are shown along these streams as well as their tributaries. This development most likely had an adverse effect on water quality, streams, wetlands, and floodplains. Based on the location of the development along the stream valleys, it is likely that extensive vegetation removal occurred within the floodplains, wetlands were filled and/or drained, streams were realigned and piped, and bridge supports were placed within the streambeds.

In the 1930s and 1940s, the expansion of Martinsville's industrial capacity led to an increase in population and clearing of local forests. In the 1944 USGS historical map (see Figure A-2 of the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j), these changes are illustrated by the expansion of Martinsville, the emergence of several small satellite communities, and the extent of cleared land in mapping from the period. This period also saw the emergence of textile production as another facet of the area's manufacturing sector. Some notable projects which occurred in this period include:

- opening of the Sale Knitting Company in 1937;
- opening of the DuPont Nylon Plant in 1941;
- opening of the Lacy Manufacturing Company in 1942; and
- the construction of the Martinsville Speedway in 1947.

In addition to these socioeconomic indication of growth, signs of natural resource extraction are also visible. Particularly in the area west of Route 220 (around Chestnut Knob and present-day Magna Vista High School), the map shows large areas that have been logged and converted to shrublands. This spike in tree removal and development, both along stream valleys and higher in the watersheds, likely worsened adverse effects to water quality, streams, wetlands, and floodplains. The conversion of landcover and expansion of impervious surface coverage presumably increased surface runoff, stream turbidity, and pollutant loading. Fill was likely added to wetlands and floodplains for additional development and/or to protect existing infrastructure.

In the 1950s and 1960s, the growth in Martinsville shifted away from a heavy emphasis on factories to less intense forms of development, most notably institutional and residential land uses as shown on the 1965 USGS historical mapping (see Figure A-3 of the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j). For example, the residential neighborhoods between Spruce Street and the Route 220 Business Corridor were largely built during this period. Another good example is the residential neighborhood south of Fayette Street, between the Smith River and Memorial Boulevard South. Many of the warehouses located on Route 220 Business, just north of the Martinsville Speedway, were also built during this period. Some of the notable projects during this period include the:

- reconstruction of Route 220 widened to four lanes south of Ridgeway in 1958;
- founding of Patrick Henry Community College in 1962;
- opening of two-lane bypass of Route 220 over the railroad west of Ridgeway opened in 1963;
- reconstruction of Route 220 north of Main Street to Route 58 to four lanes with turn lanes in 1966;
- building of Martinsville High School and Martinsville Memorial Hospital in 1967; and
- opening of Nationwide Homes' manufacturing complex on Rives Road in 1968.

In some areas, the forested cover shown in the 1965 mapping is less extensive than in the 1944 map. However, in many other areas, such as Chestnut Knob, the extent of forest cover has remained static or even increased. In terms of transportation infrastructure, the 1966 map shows substantial expansion of the paved road network. Joseph Martin Highway, Route 683, Route 684, and Route 781 all appear to be paved. The slower rate of land clearing and reforestation allowed to occur in some areas during this time period likely had a beneficial effect on water resources in the region. However, the expansion of urban development in some areas around Martinsville likely contributed to increased runoff and pollution entering the nearby waterways.

Based on the Henry County's property database, most of the local development that occurred during the 1970s, 1980s, and 1990s was commercial. Many of the storefronts located on Route 220 Business north of Route 58, for example, were constructed in this period as shown on the 1984 USGS historical mapping and the 1999 USGS historic aerial imagery provided by Google Maps™ (see Figures A-4 through A-9) of the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j). The shopping center located at the intersection of West Market Street and Commonwealth Boulevard West is a good example of the shift towards more suburban forms of development. Based upon a review of aerials, the ICE study area portion of Rockingham County has not exhibited much growth over this time period. Some notable projects which occurred in the Martinsville area during this period include the:

- reconstruction of Route 220 bypass of Ridgeway widened to four lanes in 1972;
- building of the Route 58/ Route 220 bypass west of Route 220 in 1977;
- opening of Magna Vista High School 1988;
- opening of the Patriot Centre Industrial Park at Beaver Creek in the early 1990s;
- building of the Joseph Martin Highway interchange with Route 58/Route 220 in 1993; and
- completing the Route 58 east of Route 220 was constructed in 1993.

Many of the areas shown as forested in 1965 are also shown as forested in 1984. This suggests that these forests were able to become more mature and better established. Notable exceptions to this trend are areas that were cleared for construction of the Route 220 bypass and associated development, such as the area north of the Route 220/Route 58 intersection. Based on the land use along stream valleys, it can be inferred that this time period had both beneficial and adverse effects on water resources in the area. The establishment of more mature forests likely improved stormwater attenuation in some areas, and riparian areas negatively affected by previous logging may have begun to improve. In areas cleared and developed as a result of the Route 220 bypass construction, surface runoff and pollutant loading likely increased. Some streams were probably piped, realigned, or otherwise altered. Fill material may have been placed in wetlands and floodplains.

While it appears that little development expansion occurred in this area between 1984 and 1999, water resources in the area have likely been adversely affected by continued runoff and pollutant loading from yards and impervious surfaces as well as maintenance and construction activities. However, any improvements made to the area's stormwater management facilities may have provided beneficial effects to water quality.

Since the year 2000, development in Henry County has slowed. According to Henry County's property database, most of the area's housing stock predates this period. Most of the existing commercial retail sites also predate this period. However, there have been sporadic developments over the past decade, including the introduction of the Monogram Foods manufacturing plant in 2009 and Eastman in 2013.

Additional information on actions that occurred within each of the periods noted above, can be found in the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j).

<u>Present and Reasonably Foreseeable Future Actions</u>

The list of present and foreseeable future actions was generated by reviewing local and state planning and financial documents, including: the VDOT's *SYIP for FY 2020 – 2025,* the NCDOT *2019 SYIP Map,* the *Henry County Budget FY 2019-2020*, and the *Rockingham County, North Carolina, FY 2018-2019 Adopted Budget* (VDOT, 2019a; NCDOT, 2019; County of Henry, 2019; and Rockingham County, 2019). Projects identified in these planning documents are treated as reasonably foreseeable actions because future construction funds have been set aside for them in the planning process. While the *Henry County Comprehensive Plan*, Martinsville's 2009

Comprehensive Plan Update, and the West Piedmont Planning District Commission's 2019 *Comprehensive Economic Development Strategy Annual Report* and *2035 Rural Long-Range Transportation Plan* were reviewed, these documents only identify planning priorities and do not allocate future funding towards these projects. Therefore, projects from these plans are not reasonably foreseeable future actions. Other local non-transportation projects and projects under construction by private entities are also included as reasonably foreseeable projects. **Table 3-34** lists the ten development actions that are occurring and/or are planned to occur that could contribute to cumulative effects on resources affected by the study.

Table 3-34: Present and Reasonably Foreseeable Future Projects

Associated Agency	Project	Status
VDOT	Route 220 Preservation and Improvement Plan (Various Locations)*	Design
VDOT	Route 220 / Lee Ford Camp Road Safety Improvements	Design
VDOT	Route 58 East Turn Lane at Route 58 / Route 220 Bypass	Under Construction
Henry County	Lower Smith River Wastewater Treatment Facility Renovations[2]	Design
Henry County	Patriot Centre Storm Water Management Pond #2 – Dam Study	Design
Henry County	Henry County Jail at the DuPont site[2]*	Design
Henry County	Sheriff's administration office renovation and relocation to the DuPont site[2]*	Design
Henry County / Martinsville-Henry County Economic Development Corporation	Commonwealth Crossing Business Centre Phase II	Under Construction
American Electrical Power	Commonwealth Crossing Transmission Line Project[3]	Under Construction
Eastman	Eastman to add capacity at its Patriot Centre facilities and expand into a former furniture facility in Bowles Industrial Park[4]	Design

* These locations are outside of the ICE Study Areas, but are listed since they are important projects for this area.
1 www.henrycountyva.gov/content/uploads/PDF/financials/psa_budget_binder_2019_adopted.pdf
2 www.henrycountyva.gov/jail-project; https://wset.com/news/local/construction-of-70-million-henry-county-jail-to-begin-soon
3 www.henrycountyva.gov/content/uploads/PDF/countyfinalbudgetapproved_2019.pdf
4 www.aeptransmission.com/virginia/CommonwealthCrossing/index.php
5 www.yesmartinsville.com/news/details/id/246/eastman-announces-$7-7-m-expansion-in-he

Of the actions reviewed, the most notable is a development known as the Commonwealth Crossing Business Centre. The Commonwealth Crossing Business Centre is a 726-acre planned industrial park located to the west of Route 220, north of the North Carolina state line. For more information on the Centre, please see the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j).

In addition, a series of actions have been designed to eliminate sources of water quality impairment from agriculture, forestry, and manufacturing practices in the Dan River Basin (DRBA). DRBA also has a Riparian Buffer Project at five demonstration sites, one of which is just north of the study area, the Beaver Creek Reservoir in Martinsville, Virginia, protecting the Smith River (DRBA, 2019). The DRBA has also produced a Riparian Buffer Guide to give property owners a guide to planting riparian buffer.

3.13.3.4 What are the Impacts?

Cumulative impacts consist of the direct and indirect impacts of the alternatives under consideration in this Draft EIS in combination with the impacts of past, present, and reasonably foreseeable future actions. This analysis relies on CEQ guidance to assess the severity of an impact based on context and intensity. Context may be geographic at multiple scales such as society as a whole, an affected region, affected interests, and specific localities.

Intensity, as defined by CEQ, is the severity of impact with regard to multiple factors, including:

- impacts both beneficial and adverse;
- degree of public health and safety impacted;
- unique characteristics of the geographic area;
- degree of controversy surrounding that action and the effect;
- potential to set precedent for future actions;
- cumulative effects which may be significant, even though the action itself would not create significant impacts; and
- whether there is a violation of Federal, state, or local law or requirements meant to protect the environment

Impacts with respect to each of the intensity criteria can be described in various levels of severity, from minor to major (see **Table 3-35**). The significance or importance of impacts is determined by evaluating the potential improvements against existing environmental standards, thresholds, guidelines, or objectives established by Federal, state, and local agencies. These impact significance factors are applied to all resource areas. Impacts can also be described as to their level of extent, as shown in **Table 3-35**. Impacts can range from a large extent, which means an impact would be statewide, to a medium extent, with regional impacts, to a small extent, with local impacts. The duration of an impact could range from long to short, with a long duration corresponding to over five years, a medium duration would be one to five years, and a short duration would be less than one year. It is important to note that many regulatory agencies, such as the USACE, classify long-term effects as permanent. These potential effects are taken into consideration in the following discussions of cumulative effects of the alternatives to different resources. Finally, the likelihood of an affect could range from probable to unlikely.

Table 3-35: General Effects Determination Matrix

Severity	Extent	Duration	Likelihood
Major	Large	Long	Probable
Moderate	Medium	Medium	Possible
Minor	Small	Short	Unlikely

<u>Socioeconomic Resources</u>

The cumulative impacts to socioeconomic resources due to past and present actions are closely related and are described together in the following sections.

Since the 1920s, the past actions described above have transformed the region from a rural agricultural community to a more developed area with an increase in residential and commercial development, along with continued industrial growth (refer to the ***Indirect and Cumulative Effects Technical Report*** for further discussion of the review of historic aerials, VDOT, 2020j). Past and present actions have been both beneficial and adverse to socioeconomic resources within the ICE Study Areas, and it is expected reasonably foreseeable future actions could be as well. Past and present growth and development has increased the number of communities as well as the standards of living for communities and provided for community cohesion.

As discussed in **Section 3.13.3.3**, all local and state planning and financial documents were reviewed to develop the list of reasonably foreseeable projects; although, this list is limited to only ten projects. The reasonably foreseeable future actions identified during this study consists predominantly of transportation projects designed to improve safety and enhance the function of the existing highway network. These are unlikely to generate induced growth or become a catalyst for land use change. The primary non-transportation action identified is the continued development of the Commonwealth Crossing Business Centre. At present, approximately 120 acres of the site has been cleared and prepared for development. The remaining portion (606 acres) is still wooded as of the publication of this Draft EIS. The development of the Commonwealth Crossing Business Centre is designed to provide employment opportunities for the local workforce and generally stimulate economic development. Since this conversion was and would be undertaken to provide room for the development of new commercial and industrial facilities, it and the other reasonably foreseeable future actions are considered as having a minor beneficial effect on the ICE Socioeconomic Resources Study Area's notable socioeconomic resources. However, the development would also have a minor negative impact by increasing regional traffic through the area due to increases in commuters and freight traffic. The increase in traffic would likely increase commuting times for local residents, as well as increase travel times for residents to travel to community facilities, including the schools. The associated increases in traffic noise would also continue to further fragment communities. These minor negative impacts would involve both EJ and non-EJ communities.

Collectively, the past, present and future actions identified by this analysis led to the expansion of public infrastructure, the development of community facilities, and the creation of economic opportunities for a substantial portion of the local population. The emergence of regional trends which reduced the competitiveness of the local manufacturing sector have undermined the impact of these benefits. However, coordinated efforts amongst the local officials and members of the business community show that alternative economic models are possible. Therefore, the past, present and future actions identified by this analysis contribute to a moderate beneficial impact on the ICE Socioeconomic Resources Study Area's notable socioeconomic resources.

No-Build Alternative

The No-Build Alternative would result in continued conflicts between regional and local traffic, increasing traffic through the area that has already encountered an increase in regional traffic. Over time, this reduction in accessibility between the communities, community facilities, and local businesses could result in impacts to community cohesion and loss of business and employment in the ICE Socioeconomic Resources Study Area. As traffic volumes increase in the future, crossing Route 220 would become increasingly difficult and dangerous, continuing the community fragmentation of residences located on either side of the roadway. Additionally, the increased traffic volume would emphasize the fragmentation and further contribute to traffic delays. These conditions would also continue to inhibit the movement of emergency vehicles traveling along Route 220. The increase in truck and passenger vehicles on Route 220 could contribute to safety concerns to adjacent communities. Additional proximity impacts, such as traffic noise, are also expected as a result of the increased traffic along the existing roadway network.

Alternative A

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on land use and community cohesiveness by potentially converting 574 acres of residential, agricultural, and industrial land uses and public right of way/undeveloped land into transportation facilities. Over the short term, the conversion of developed properties has the potential to disrupt community life. Vehicular access and general mobility would both be altered as construction progresses. These effects would interrupt household and community activities but are not expected to lead to changes in land use or community cohesion. Over the long term, the potential relocation of homes and other properties have the potential to change the character of the affected areas. Given the projected impacts associated with Alternative A, this change in character is most likely to occur in the southern segment of Alternative A (between Reservoir Road and the North Carolina-Virginia state line). In this area, the construction of a new interchange would effectively split the J.B. Dalton neighborhood. In addition to the disruption caused by relocations, Alternative A in this area would adversely affect community cohesion by potentially increasing traffic noise and visual intrusions. The conversion of undeveloped parcels (found mostly in the northern segments of Alternative A) may also lead to changes in land use (through induced growth). In these areas, the direct effects associated with the introduction of an access-controlled highway facility are buffered by larger setbacks and the prevalence of low-density rural development. Combined with the increase in the number of communities that has occurred over the years, the increase in the standards of living for the communities, and the potential increase in traffic associated with the Commonwealth Crossing Business Centre, the cumulative effect would be minor.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's economic resources by reducing the congestion on Route 220, allowing easier access to those traveling to the local businesses located on the existing alignment. Additionally, the addition of potential interchanges under Alternative A would provide redevelopment opportunities in their vicinity. The scale and extent of the redevelopment opportunities would be strongly influenced by factors such as: the willingness of nearby landowners to develop or sell their property, the demand for highway related services, and how Henry County's planners and commissioners respond to proposed zoning changes. Combined with the reasonably foreseeable future transportation projects and the development of the Commonwealth Crossing Business Centre, the cumulative effect would be a beneficial increase in employment opportunities for the local workforce and a benefit to the business economy within the area.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's community facilities, parks, and open spaces by making them easier to access. Existing congestion reduces access to these facilities. Alternative A would divert regional traffic to the new roadway. This change would allow vehicles turning off local roads, such as Lee Ford Camp Road and Church Street, to cross and enter Route 220 more freely. Similarly, the reduced presence of regional traffic would make pedestrian crossings of Route 220 safer. At community facilities, such as Drewry Mason Elementary School, this improvement would facilitate better connections with residential uses on the opposite side of Route 220. The potential relocation of one cemetery could cause long-term minor adverse effects by potentially redirecting the use associated with the displaced cemetery to other facilities. Combined with the development of community facilities that has occurred over the years, and the number of cemeteries available in the area, the cumulative effect would be minimal.

Alternative A would contribute to the cumulative effect of past, present, and reasonably foreseeable future actions on environmental justice populations through potential right of way acquisition, altering traffic operations, creating new access points, and expanding roadway capacity. Out of 17 potential residential relocations, three occur within block groups identified as having environmental justice populations. These potential relocations, combined with the introduction of the new roadway facility in an otherwise rural setting, could adversely affect community cohesion in the short-term. Since most of the potential relocations required for Alternative A do not occur in minority block groups, the potential cumulative effect is not considered disproportionate. Alternative A would contribute minor adverse but not disproportionate increments to the overall cumulative effect to environmental justice populations associated with past, present, and other reasonably foreseeable future actions.

Overall, Alternative A would likely generate a variety of minor adverse and beneficial effects, incrementally contributing to the overall cumulative effect to the ICE Socioeconomic Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

Alternative B

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on land use and community cohesiveness by potentially converting 584 acres of residential, agricultural, and industrial land uses, and public right of way/undeveloped land into transportation facilities. The character of the short and long-term effects associated with these forms of land conversion are the same as those discussed for Alternative A.

As discussed for Alternative A, Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's economic resources by redirecting regional traffic and creating new roadway access points. The character of the environmental consequences associated with these actions are the same as those discussed for Alternative A.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomic Resources Study Area's community facilities, parks, and open spaces by making them easier to access. Alternative B is expected to generate the same operational benefits as Alternative A.

Alternative B would contribute to the cumulative effect of past, present, and reasonably foreseeable future actions on environmental justice populations through potential right of way acquisition, altering traffic operations, creating new highway access points, and expanding roadway capacity. Out of 26 potential residential relocations, nine occur within block groups identified as having environmental justice populations. These potential relocations, combined with the development of a new roadway facility within in an otherwise rural setting, could deter interactions between community members and therefore indirectly undermine community cohesion in the short-term. Since most of the potential relocations required for Alternative B do not occur in minority block groups, the potential indirect adverse effect is not considered disproportionate. Alternative B would contribute minor adverse but not disproportionate increments to the overall cumulative effect to environmental justice populations associated with past, present, and other reasonably foreseeable future actions.

Overall, Alternative B would likely generate a variety of minor adverse and beneficial effects, incrementally contributing to the overall cumulative effect to the ICE Socioeconomic Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

Alternative C (Preferred Alternative)

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on land use and community cohesiveness by potentially converting 541 acres of residential, agricultural, and industrial land uses, and public right of way/undeveloped land into transportation facilities. The character of the short and long-term effects associated with these forms of land conversion are fundamentally the same as those discussed for Alternative A.

As discussed for Alternative A, Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomics Resources Study Area's economic resources by redirecting regional traffic and creating new roadway access points. The basic environmental consequences associated with these actions are the same as those discussed for Alternative A.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on the ICE Socioeconomics Resources Study Area's community facilities, parks, and open spaces by making them easier to access. Alternative C is expected to generate the same operational benefits as Alternatives A and B.

Alternative C would contribute to the cumulative effect of past, present, and reasonably foreseeable future actions on environmental justice populations through potential right of way acquisition, altering traffic operations, creating new roadway access points, and expanding roadway capacity. Out of the 25 potential residential relocations, nine occur within block groups identified as having environmental justice populations. These potential relocations, combined with the development of a new roadway facility within in an otherwise rural setting, could deter interactions between community members and therefore indirectly undermine community cohesion in the short-term. Since most of the potential relocations required for Alternative C do not occur in minority block groups, the potential indirect adverse effect is not considered disproportionate. Alternative C would contribute minor adverse but not disproportionate increments to the overall cumulative effect to environmental justice populations associated with past, present, and other reasonably foreseeable future actions.

Overall, Alternative C would likely generate a variety of minor adverse and beneficial effects, incrementally contributing to the overall cumulative effect to the ICE Socioeconomic Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

Natural Resources

The following analysis is based on a review of historic aerials and topographic maps that was conducted for the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j). Past and present actions have been both beneficial and adverse to natural resources within the ICE Natural Resources Study Area, and it is expected that reasonably foreseeable future actions could be as well. The area's growth and development in the early 20th century was primarily associated with the regional transition away from the tobacco industry and towards logging, furniture manufacturing, and textiles. Based on the historical surveys conducted by the National Trust for Historic Preservation (NTHP) and the VDHR, this transition required the clearing of land for building materials and agricultural production. The oldest mapping maintained by the USGS (dated August 1925), however, does not illustrate the extent of terrestrial habitats, floodplains, or wetlands. Because of this, there is not adequate evidence to support a quantitative assessment of the effects of early periods of development on the ICE Natural Resources Study Area's notable natural resources. Based on the general description of the industrialization process provided in the NTHP and VDHR surveys, however, some qualitative determinations can be made.

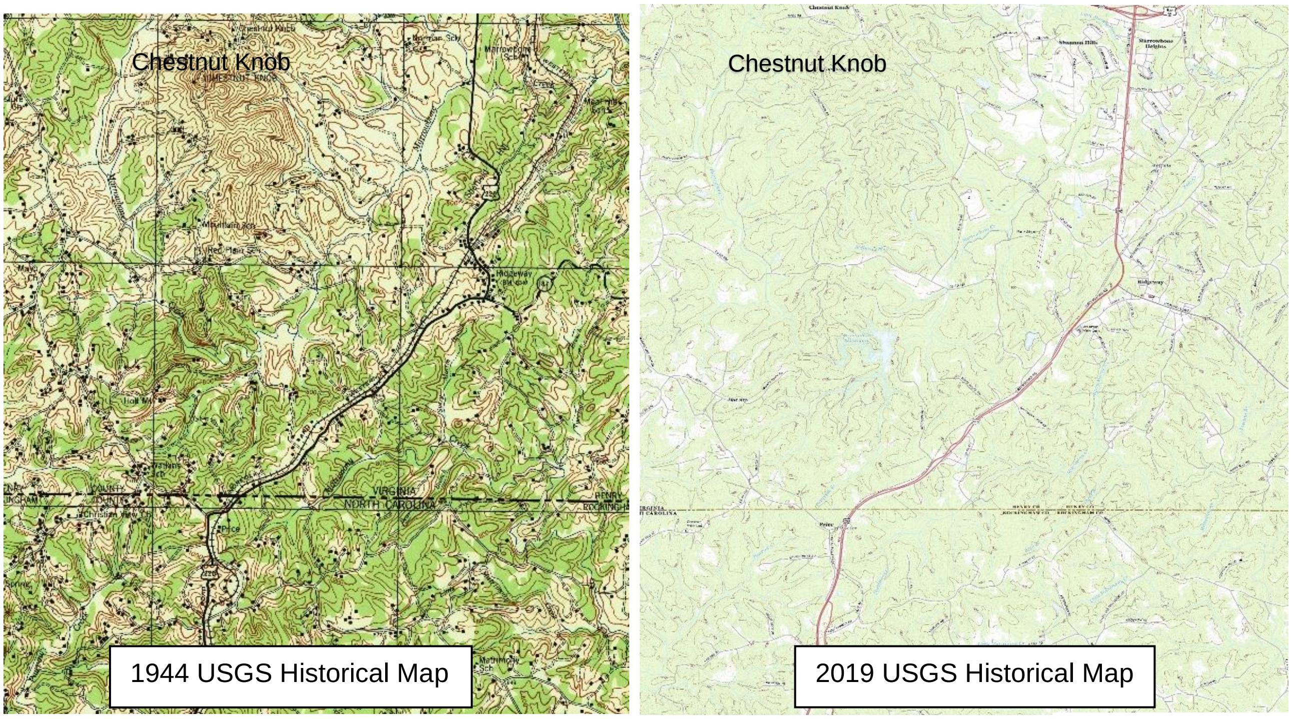
The industrialization of the Martinsville area generally required the clearing of forested lands to meet the growing demand for building materials, food, and open land. Although the exact location and extent of clearing is not known, it is reasonable to assume that this clearing reduced the amount and quality of habitat available for the area's forest-adapted species. Other than the clearing itself, the primary mechanisms driving habitat degradation would have been the creation of edge conditions where plants and animals adapted to the shady forest understory do poorly. It is worth noting that since invasive species were less common during this era, the disturbed sites would likely have been colonized by native plants and animals adapted to the area's grasslands.

Given the presence of numerous streams and wetlands within the ICE Natural Resources Study Area's existing forests, it is reasonable to assume that the clearing adversely affected the quality and extent of aquatic habitats. In some cases, the effect would have been the result of changes to the physical environment surrounding the aquatic habitat. The removal of shade-casting trees around a stream, for example, can result in increased water temperatures and reduced levels of dissolved oxygen. Other noteworthy examples include the removal of vegetation stabilizing floodplains and the installation of drainage tiles in wetlands. These direct changes would have in turn led to systemic water quality issues, most notably increased turbidity and stream discharge immediately following storm events. Another likely consequence of the disruption of aquatic habitats is a change in flooding patterns. The continued conversion of the area's forested floodplains would likely have generated both water quality issues (due to increased soil erosion during flood events) and a loss of habitat for waterfowl and other species which are known to use riparian forests. The construction of a hydroelectric dam across the Smith River in 1924 would have mitigated some of the flooding concerns by moderating the river's flow but would have become a barrier for the movement of some aquatic species.

The degradation of both terrestrial and aquatic habitats during the early part of the 20th century would have placed some stress on the ICE Natural Resources Study Area's rare, threatened, and endangered species. Based on the lack of historical records discussing the characteristics of wildlife populations, it is difficult to discern the severity of this stress. However, given the sheer amount of habitat available at the time and the limited scale of development that has occurred, it is reasonable to conclude that the actions taken during this period of development likely resulted in a minor adverse effect on the ICE Natural Resources Study Area's notable natural resources.

During the 1940s, the ICE Natural Resources Study Area's economic prosperity continued, supporting the creation of new residential subdivisions, the Martinsville Speedway, factories, and public institutions. The best available reference for the state of the area's notable natural resources at the beginning of this period is a USGS map prepared in 1944. **Figure 3-25** shows a side by side comparison of 1944 USGS historical map to the 2019 USGS historical map. These figures are shown in greater detail in the Appendix A of the ***Indirect and Cumulative Effects Technical Report*** (VDOT, 2020j). The 1944 map shows cleared land and brush occupying a much greater amount of the ICE Natural Resources Study Area than the 2019 map. The area where this distinction between the present and mid-20th century condition is most stark is the roughly 8-square mile area surrounding Chestnut Knob. In the 1944 USGS map, what is currently a mix of open and forested environments is shown as almost entirely brush and open land. This cleared area extends roughly from Route 220 in the east to Horsepasture Price Road in the west and Lee Ford Camp Road in the south and Soapstone Road in the north. Since the 1925 USGS map does not contain land cover information, it is unclear when this area was deforested. However, based on the general description of the industrialization process provided in the NTHP and VDHR surveys, it most likely occurred sometime in the 1930s and 40s.

Figure 3-25: 1944 USGS Historical Map and 2019 USGS Historical Map



The clearing of large swaths of forests in the middle of the 20th century intensified the impacts generated during earlier periods of industrialization. As a result, the effects on natural areas and wildlife would have been like those generated during early periods of development, but potentially more intense. The emergence of habitat fragmentation is a good example of this change in severity. Whereas earlier periods of resource extraction left the overall network intact, the clearing illustrated in the 1944 USGS map clearly shows the creation of isolated forests. This fragmentation not only alters the physical characteristics of the remaining habitat, but also makes it difficult for animal and plant populations to reproduce and react to changes in resource availability and disturbance events. This effect is perhaps the most meaningful for aquatic species, which often have few if any opportunities for relocation.

The other land use change that is visible in this 1944 USGS map is the expansion of Martinsville. Whereas the 1925 USGS map showed a relatively tight network of streets, the 1944 map shows a network of corridors expanding beyond the city's core. Within the ICE Natural Resources Study Area, Routes 58 and 220 were the corridors which included the most development. Since the 1925 USGS map lacks land cover information, it is unclear if the development along these corridors involved the clearing of forests. However, given the age of both corridors, it is likely that some of the structures shown in the 1944 USGS map utilized previously developed sites. In addition to effects associated with deforestation and land conversion, the expansion of Martinsville's urban footprint had an adverse effect on water quality by increasing the generation of both point source (e.g. sewage and industrial waste) and nonpoint source (e.g. run-off) water pollution. Both forms of pollution in turn had an adverse impact on the quality of aquatic habitats and the wildlife that utilize them. Fecal coliform and *E. coli* are primary examples of pollutants whose concentrations likely increased because of urban growth. These effects, combined with the fragmentation of wildlife habitats, suggests that this period of development had a major adverse effect on the ICE Natural Resources Study Area's notable natural resources.

By the mid-1960s, suburban development around Martinsville was occurring, but the overall rate of deforestation had slowed. The best references for this period are a series of USGS maps produced in 1964, 1965, and 1966. Like the 1944 USGS map, these maps provide a record of infrastructure, general land cover, and prominent natural features. Most of the development shown in the maps (relative to the 1944 USGS map), are located at the edge of Martinsville's municipal boundary. The neighborhood located along Route 685 between Route 58 and Route 220-Business is a good example. In this area, the 1944 USGS map shows a dirt road with a handful of structures. The landcover is a mix of cleared land and forest. In the 1965 USGS map, much of the present-day Rich Acres neighborhood is identified, including more than 50 structures, a school, a church, and a drive-in theater. Forested areas seem to have expanded slightly, but otherwise the landcover remained unchanged. Another good example of suburban development is the residential community surrounding Lake Lanier. In this area, the 1944 USGS map shows two paved roads, the Lanier Farm School, and as many as two dozen structures. Except for the southern portion (which is cleared) the area is shown as forested. In the 1964 USGS map, dozens of paved streets provide access to hundreds of structures, Lake Lanier (a reservoir), and the Forest Parks County Club. The development of Rich Acres, Lake Lanier, and other suburban communities adversely impacted the ICE Natural Resources Study Area's notable natural resources by increasing the prevalence of impervious surface and the generation of nonpoint source water pollution. In areas where natural areas were cleared, development also led to a reduction in the availability of wildlife habitat.

In addition to illustrating suburban development around Martinsville, the USGS mapping collected during the mid-1960s provides evidence that some of the areas which are shown as being open or brushy in the 1944 USGS map had begun to regenerate. The complete regeneration of hardwood forests is a process that can takes decades, if not centuries, to complete. However, the presence of intact forests nearby suggests the formerly cleared areas were probably recolonized rapidly by native plants and animal species. Although the overall effect of clearing forests is adverse, this recolonization offset some of the disruptive actions taken and reduced the period's overall effect on the ICE Natural Resources Study Area's notable natural resources to a minor level.

Starting in the late 1980s, a series of local and regional actions combined to notably weaken the local manufacturing sector. This downward trend resulted in a much lower demand for cleared land and development. Some commercial development occurred during this period, but most were associated with developed corridors such as Route 457. From a natural resources perspective, this period of slowed growth was beneficial because it provided an opportunity for formerly-cleared areas to continue to regenerate. Aerial images collected in 1999 show clear evidence that many of the areas shown as deforested in the earlier USGS mapping had undergone some level of reforestation. As noted earlier in this section, the area that most clearly illustrates this trend is the land around Chestnut Knob. In addition to providing a large amount of terrestrial habitat, this area also contains numerous streams (*e.g.* Marrowbone Creek, Patterson Branch, and Stillhouse Run) and wetlands. Although this process of reforestation is more of a passive trend than the result of any private or public program, it is an important aspect of the ICE Natural Resources Study Area's history and significant enough that it most likely offset a substantial amount of the impacts associated with this period of development so that the overall effect to the ICE Natural Resources Study Area's notable natural resources was adverse but minor.

The reasonably foreseeable future actions consist predominately of transportation projects designed to protect and enhance the safety and function of the existing highway network. Many of these projects are not inherently designed to address existing natural resources impairments, but they may provide the opportunity to have a beneficial impact on aquatic habitats and water quality by updating or including stormwater management facilities. If completed, these actions could have a minor beneficial effect on the ICE Natural Resources Study Area's aquatic habitats and general water quality.

The primary non-transportation action identified is the continued development of the Commonwealth Crossing Business Centre. At present, approximately 120 acres of the site have been cleared and prepared for development. The remaining portion (606 acres) is still wooded. Based on aerial photography, the land which the development occupies was once completely forested. Because of this clearing, both the present and future development of the Business Centre would have an adverse impact on the ICE Natural Resources Study Area's notable natural resources by reducing the availability of wildlife habitat, adding impervious surface to the local watersheds, and increasing the generation of nonpoint source water pollution. Some of these adverse impacts on water quality may be offset by the construction of on-site stormwater management facilities.

Other reasonably foreseeable future actions include the completion of the Commonwealth Crossing Transmission Line Project and the relocation of the Henry County Jail to the Dupont Site along the Smith River. The continued work on the Commonwealth Crossing Transmission Line Project would likely result in additional clearing and habitat conversion, thus having an adverse impact on the ICE Natural Resources Study Area's natural resources. The relocation of the Henry County Jail would result in the repurposing of an abandoned industrial site and could result in updates to existing stormwater facilities and infrastructure. If so, this study may have a minor beneficial impact on natural resources within the ICE Natural Resources Study Area.

Collectively, the past, present, and future actions identified by this analysis include the clearing and fragmentation of forests, the destruction of aquatic habitats, and the general degradation of water quality. These actions have led to adverse impacts to the ICE Natural Resources Study Area's notable natural resources. In the last quarter of the 20th century, however, the decline in the local manufacturing sector reduced the demand for cleared land and created an opportunity for some of the previously cleared forests to regenerate. Although this process of regeneration is more of a passive trend than the result of a private or public program, it nevertheless has had a positive impact on not only the ICE Natural Resources Study Area's forests, but also the streams, wetlands, and floodplains they contain. Therefore, the past, present, and future actions identified by this analysis constitute a moderate adverse effect on the ICE Natural Resources Study Area's notable natural resources.

No-Build Alternative
The No-Build Alternative would not result in any incremental effect to water resources, floodplains, wildlife habitat, or threatened and endangered species in the Cumulative Effects Study Area.

Alternative A
Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on water quality by disturbing existing natural areas, increasing the extent of impervious surfaces and compacted soils, increasing nonpoint source pollution from roadways, and renovating existing stormwater management facilities. Over 20 percent of the waterways in the Dan River Basin are currently classified as impaired (PTRC, 2012). The primary source of this impairment is the presence of high levels of E. coli. Since Alternative A would not affect the status of the existing sanitary sewer infrastructure, it is unlikely that it would have any effect on this source of impairment. The clearing of forested lands required to construct Alternative A would contribute to forms of water quality impairment associated with the removal of vegetation and an increased presence of impervious surfaces. These actions would likely decrease the capacity of affected watersheds to capture heavy rainfalls thereby increasing stream turbidity, increasing the concentration of road-sourced water pollutants in surface water bodies, and increasing the occurrence of thermal pollution. Although these effects are not projected to affect

Beaver Creek (the ICE Natural Resources Study Area's primary source drinking water), they would contribute to the general degradation of water quality.

Alternative A is projected to have a large direct impact on the ICE Natural Resources Study Area's overall water quality. This is based on the combined impacts to vegetative cover and aquatic systems including streams and wetlands. Since Alternative A would involve the renovation and/or installation of existing stormwater management facilities, some of the adverse effects could likely be offset. The construction of any mitigation measures determined to be warranted through the regulatory permitting process presents a similar opportunity. Taking this into consideration, Alternative A would contribute moderate adverse impacts to the overall cumulative effects on water quality associated with past, present, and other reasonably foreseeable future actions.

The ICE Natural Resources Study Area's past and present developments have adversely affected the quality of local streams through channelization, the creation of impoundments (i.e., the Smith River Dam and the Martinsville Reservoir), and altering the surrounding natural landscape. Alternative A, and similar future actions, would exacerbate these effects by placing some streams in drainage conveyances, altering surface-water hydrology, and clearing forested lands. Of the three alternatives, Alternative A is projected to generate a large direct impact to streams (approximately 28,998 linear feet of stream channel). Some of the adverse effects could be minimized by the renovation and installation of stormwater management facilities and proper use of erosion and sediment controls during construction. Unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted through the regulatory permitting process. Considering all these factors, Alternative A would contribute moderate to major adverse impacts to the cumulative effects on streams associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wetlands by disturbing existing natural areas, altering surface-water hydrology, and renovating existing stormwater management facilities. The ICE Natural Resources Study Area's past and present developments have adversely affected the quality of local wetlands by reducing their extent (through the installation of drainage tiles and the placement of fill), altering surface water hydrology through the alteration of the surrounding land cover, and the creation of impoundments (i.e., the Smith River Dam and the Martinsville Reservoir). Alternative A, and similar future actions, would exacerbate these effects by filling wetlands, altering surface-water hydrology, and clearing forested lands. Alternative A is projected to impact approximately 7.8 acres of wetlands. Some of the adverse effects could be minimized by the renovation and installation of stormwater management facilities, proper use of erosion and sediment control practices during construction, and replanting temporarily impacted areas with native species observed on site. Unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted by the regulatory permitting process. Considering all these factors, Alternative A would contribute moderate to minor adverse impacts to the overall cumulative effect on wetlands associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on floodplains in ways previously discussed for streams and wetlands. Overall, Alternative A is projected to generate a direct impact on floodplains (approximately 7.0 acres). Some of the adverse effects could be offset by the renovation and installation of stormwater management facilities, allowing proper drainage and connectivity of surface flow, and the use of bridges that span floodplains rather than using fill and piping streams. Unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted by the regulatory permitting process. Taking this into consideration, Alternative A would contribute minor adverse impacts to the overall cumulative effects on floodplains associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wildlife habitat by disturbing existing natural areas, altering vegetative structure and species composition, expanding highway usage, fragmenting habitat, and altering hydrologic regimes. The ICE Natural Resources Study Area's past and present developments have adversely affected the quality and viability of local wildlife and the habitat they rely on. This effect is derived from many activities, including deforestation, conversion of grasslands and floodplains for agricultural use, altering surface water hydrology, the creation of impoundments (i.e., the Smith River Dam and the Martinsville Reservoir), and the introduction of invasive species. Despite these impacts, areas of high-quality forested habitat can still be found within the ICE Natural Resources Study Area. Alternative A is projected to have a direct impact on forested areas (approximately 318 acres). Some of the adverse effects could be minimized by the proper use of erosion and sediment control measures and stormwater management practices, the use of structures which preserve stream morphology and wildlife habitat connectivity such as bridges and countersunk culverts, replanting temporarily impacted areas with native species observed on site, and using caution to avoid the introduction of invasive species. Unavoidable impacts could be offset through the implementation of mitigation measures determined to be warranted through the regulatory permitting process. Taking this into consideration, Alternative A would contribute moderate adverse impacts to the overall cumulative effects on wildlife habitat associated with past, present, and other reasonably foreseeable future actions.

Alternative A would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on threatened and endangered species in many of the same ways discussed above for wildlife habitat. The ICE Natural Resources Study Area contains six species listed as threatened or endangered by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 3-32**). Natural areas which may provide suitable habitat for some of the listed species are relatively abundant in the ICE Natural Resources Study Area but have encountered degradation because of past and present development. Alternative A, and similar future actions, could exacerbate this degradation. Some of the adverse effects could be minimized by the proper use of sediment and erosion control and stormwater management practices, the use of structures which preserve stream morphology and wildlife habitat connectivity such as bridges and countersunk culverts, replanting temporarily impacted areas with native species observed on site, using caution to avoid the introduction of invasive species, and phasing construction to follow any necessary Time of Year Restrictions (TOYR). Unavoidable impacts could be offset through the implementation of any mitigation measures determined to be warranted through the regulatory permitting process. Taking this into consideration, Alternative A would contribute moderate adverse impacts to the overall cumulative effects on threatened and endangered species associated with past, present, and other reasonably foreseeable future actions.

Alternative B

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on water quality by disturbing existing natural areas, increasing the extent of impervious surface and compacted soils, increasing nonpoint source pollution from roadways, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. The practices that could be used to minimize and mitigate impacts to water quality for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate to minor adverse impacts to the overall cumulative effects on water quality associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on streams by disturbing existing natural areas, placing some streams in conveyances, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 20,548 linear feet of stream channel. The practices that could be used to minimize and mitigate impacts to streams for Alternative B are the same as those discussed for Alternative A. Since Alternative B involves the reconstruction of the existing Route 58/Joseph Martin Highway interchange, the scale of beneficial effects generated from the renovation of existing drainage facilities should be larger than that from Alternative A. Taking this into consideration, Alternative B would contribute moderate adverse impacts to the overall cumulative effects on streams associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wetlands by disturbing existing natural areas, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 5.9 acres of wetland. The practices that could be used to minimize and mitigate impacts to wetlands for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate to minor adverse impacts to the overall cumulative effects on wetlands associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on floodplains by disturbing existing natural areas, altering surface hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 13.7 acres of floodplains. The practices that could be used to minimize and mitigate impacts to floodplains for Alternative B are the same as those discussed for Alternative A. The reconstruction of the existing Route 58/Joseph Martin Highway interchange would contribute moderate to minor adverse impacts to the overall cumulative effects on floodplains associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wildlife habitat by disturbing existing natural areas, altering vegetative structure and species composition, expanding highway usage, fragmenting habitat, and altering hydrologic regimes. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative B is projected to impact approximately 261 acres of forests. The practices that could be used to minimize and mitigate impacts to wildlife habitat for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate adverse impacts to the overall cumulative effects on wildlife habitat associated with past, present, and other reasonably foreseeable future actions.

Alternative B would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on threatened and endangered species in many of the same ways discussed for wildlife habitat. The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 3-32**). Natural areas which may provide suitable habitat for some of the listed species are relatively abundant in the ICE Natural Resources Study Area but have encountered degradation because of past and present development. Alternative B, and similar future actions, could exacerbate this degradation. The practices that could be used to minimize and mitigate impacts to protected species for Alternative B are the same as those discussed for Alternative A. Taking this into consideration, Alternative B would contribute moderate adverse impacts to the overall cumulative effects on threatened and endangered species associated with past, present, and other reasonably foreseeable future actions.

Alternative C (Preferred Alternative)
Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on water quality by disturbing existing natural areas, increasing the extent of impervious surface and compacted soils, increasing nonpoint source pollution from roadways, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. The practices that could be used to minimize and mitigate impacts to water quality for Alternative C are the same as those discussed for Alternative A. Taking this into consideration, Alternative C would contribute moderate to minor adverse impacts to the overall cumulative effects on water quality associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on streams by disturbing existing natural areas, placing some streams in conveyances, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to impact approximately 21,882 linear feet of stream channel. The practices that could be used to minimize and mitigate impacts to streams for Alternative C are the same as those discussed for Alternative A. Since Alternative C involves the reconstruction of the existing Route 58/Joseph Martin Highway interchange, the scale of beneficial effects generated from the renovation of existing drainage facilities should be similar to that of Alternative B but larger than that of Alternative A. Taking this into consideration, Alternative C would contribute moderate adverse impacts to the overall cumulative effects on streams associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wetlands by disturbing existing natural areas, altering surface-water hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to impact approximately 3.7 acres of wetland. The practices that could be used to minimize and mitigate impacts to wetlands for Alternative C are the same as those discussed for Alternative A. Since Alternative C involves the reconstruction of the existing Route 58/Joseph Martin Highway interchange, the scale of beneficial effects generated from the renovation of existing drainage facilities should be similar to that of Alternative B but larger than that of Alternative A. Taking this into consideration, Alternative C would contribute minor adverse impacts to the overall cumulative effects on wetlands associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on floodplains by disturbing existing natural areas, altering surface hydrology, and renovating existing stormwater management facilities. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to impact approximately 7.5 acres of floodplains. The practices that could be used to minimize and mitigate impacts to floodplains for Alternative C are the same as those discussed for Alternative A. The reconstruction of the existing Route 58/Joseph Martin Highway interchange would contribute moderate to minor adverse impacts to the overall cumulative effects on floodplains associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on wildlife habitat by disturbing existing natural areas, altering vegetative structure and species composition, expanding highway usage, fragmenting habitat, and altering hydrologic regimes. The type of environmental consequences associated with these actions are similar to those discussed under Alternative A. Alternative C is projected to directly impact approximately 224 acres of forests. The practices that could be used to minimize and mitigate impacts to wildlife habitat for Alternative C are the same as those discussed for Alternative A. Taking this into consideration, Alternative C would contribute moderate to minor adverse impacts to the overall cumulative effects on wildlife habitat associated with past, present, and other reasonably foreseeable future actions.

Alternative C would contribute to the cumulative effects of past, present, and reasonably foreseeable future actions on threatened and endangered species in many of the same ways discussed for wildlife habitat. The ICE Natural Resources Study Area contains six species listed as endangered or threatened by the USFWS and 11 species listed as endangered or threatened by Virginia and/or North Carolina (see **Table 3-32**). Natural areas which may provide suitable habitat for some of the listed species are relatively abundant in the ICE Natural Resources Study Area but have encountered degradation because of past and present development. Alternative C, and similar future actions, could exacerbate this degradation. The practices that could be used to minimize and mitigate impacts to protected species for Alternative C are the same as those discussed for Alternative A. Taking this into consideration, Alternative C would contribute moderate to minor adverse impacts to the overall cumulative effects on threatened and endangered species associated with past, present, and other reasonably foreseeable future actions.

Historic Resources

With human occupation of the Martinsville area extending thousands of years into the past and ongoing today, archaeological and architectural historic properties have been continuously created and destroyed by succeeding developments over time in the ICE Historic Resources Study Area. These modifications occurred most extensively from the early 1920s through the 1970s, as the area's industrialization fueled the expansion of multiple forms of development. Transportation improvements and other actions potentially adversely affected archaeological and architectural historic properties by destruction or altering the integrity of their historically important characteristics. Federal and state laws requiring agencies to consider effects to historic properties have slowed the loss of historic properties. As described in **Section 3.4**, Section 106 of the NHPA of 1966 (as amended) (54 U.S.C. §306108) and its implementing regulations (36 CFR §800) require Federal agencies to take into account the effects of their undertakings on historic and archaeological properties. Additionally, Section 4(f) of the USDOT Act of 1966 allows for the use of a historic property only if there is no prudent and feasible alternative. Transportation improvements can also increase visitation to historic properties open to the public, sustaining historic resources tourism and providing incentives for preservation. Other incentives for historic preservation are offered by Federal, state, and local governments in the form of grants and tax breaks.

No-Build Alternative

Under the No-Build Alternative, historic resources in the vicinity of Route 220 would continue to have proximity effects associated with vehicular and truck traffic.

Alternative A, B, and C

All direct and indirect effects to archaeological and historic architectural properties have been considered under Section 106 of the NHPA as described in the archaeological and historic architectural sections of the Draft EIS.

Past and present development actions have directly and indirectly impacted archaeological and historic architectural historic properties. Future actions in the ICE Historic Resources Study Area such as redevelopment projects conducted by local governments, various transportation projects, and other present and reasonably foreseeable projects could have adverse effects to historic properties. Federal, state, and local regulations would continue to minimize potential adverse effects to historic properties from their actions. Section 4(f) requires Federal DOT agencies to avoid adversely impacting architectural historic properties important for preservation in place and authorizes adverse effects only if there is no other prudent and feasible alternative. The incremental contribution of the Build Alternatives to cumulative effects on historic properties would be none to minor adverse.

3.13.3.5 What is the Overall Impact on Various Resources from Accumulations of the Actions?

Alternatives A, B, and C would likely generate a variety of adverse and beneficial effects to socioeconomic resources. In most cases, there are procedures and regulations in place at both the state and local level to help offset losses and accentuate gains. Some of the procedures, such as the relocation assistance services provided by VDOT, are consistent enough to be reasonably foreseeable. However, many of the other processes (most notably the opportunities for economic redevelopment around interchanges), are reliant not only on timely administrative updates to local ordinances (i.e., rezoning) but also favorable economic conditions. Overall, Alternatives A, B, and C would contribute adverse increments to the cumulative effect to the ICE Socioeconomics Resources Study Area's notable socioeconomic resources associated with past, present, and other reasonably foreseeable future actions.

Alternatives A, B, and C would likely generate a variety of adverse and beneficial effects to water resources, floodplains, wildlife habitat, and threatened and endangered species. In most cases, there are procedures and regulations in place at both state and local level to help offset losses and accentuate gains. Some of the procedures, such as state and Federal requirements to mitigate direct impacts to wetlands, are consistent enough to be reasonably foreseeable. However, many of the other processes (most notably the extent and focus of ongoing soil and water conservation efforts), are variable. Overall, Alternatives A, B, and C would contribute adverse impacts to the overall cumulative effects associated with past, present, and other reasonably foreseeable future actions.

Alternatives A, B, and C would likely generate a variety of adverse and beneficial effects to historic resources. Alternatives A, B, and C would contribute none to adverse impacts to the overall cumulative effects associated with past, present, and other reasonably foreseeable future actions.

The potential incremental contribution of the Build Alternatives to cumulative effects on the resources evaluated are summarized in **Table 3-36**. Incremental effects of the alternatives contributing to cumulative socioeconomic, natural, and historic resources would range from moderate beneficial to major adverse. Coupled with past, present, and future actions, the overall cumulative effects of the Build Alternatives would range from beneficial to adverse to socioeconomic resources, adverse to natural resources, and none to minor to historic resources.

Table 3-36: Summary of Build Alternative Incremental Contribution Effects[1]

Resource	Alternative A	Alternative B	Alternative C (Preferred Alternative)	Cumulative Effect
Land Use / Community Cohesion	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Economic Resources	Minor Beneficial	Minor Beneficial	Minor Beneficial	Beneficial
Community Facilities, Parks, and Open Spaces	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Environmental Justice	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Water Resources	Major to Minor Adverse	Moderate to Minor Adverse	Moderate to Minor Adverse	Adverse
Floodplains	Minor Adverse	Moderate to Minor Adverse	Moderate to Minor Adverse	Adverse
Wildlife Habitat	Moderate Adverse	Moderate Adverse	Moderate to Minor Adverse	Adverse
Threatened & Endangered	Moderate Adverse	Moderate Adverse	Moderate to Minor Adverse	Adverse
Archaeological Sites	Minor Adverse	Minor Adverse	Minor Adverse	Adverse
Historic Structures	Minor Adverse	Minor Adverse	None	None to Adverse

Note: Shaded column denotes Preferred Alternative.
*[1] See **Table 3-35** for definitions of the severity of cumulative effects*

3.14 IRREVERSIBLE AND IRRETRIEVABLE RESOURCES

Implementation of any of the alternatives retained for detailed evaluation in this Draft EIS would require the commitment of a range of natural, physical, human, and fiscal resources. Under the implementing regulations for NEPA, any expenditure of these resources that would be considered irreversible or irretrievable is required to be included in the discussion of potential environmental impacts of the alternatives (40 CFR §1502.16). Irreversible impacts are those that cause, through direct or indirect effects, use or consumption of resources in such a way that they cannot be restored or returned to their original condition, regardless of the mitigation efforts in place. An irretrievable impact or commitment of resources refers primarily to the use of nonrenewable resources. In accordance with the requirements of NEPA, this section describes the irreversible and irretrievable resource losses that may occur with the implementation of the alternatives retained for detailed evaluation in this Draft EIS. The summary that follows also includes consideration of these resource commitments to ensure that their consumption is justified.

The irreversible dedication of land to transportation use for the construction of any of the alternatives retained for study would render the land unusable for any other use. As a result, the property impacts associated with the Build Alternatives could cause a decline in tax revenues for those properties, as their value would likely be decreased. Even though the structures required for any of these alternatives would likely be relocated or replaced with structures of equal or greater value in other locations, these structures themselves would be irreversibly removed from the tax base. However, due to the relative sizes of the taxing entities, the losses incurred are not expected to have a long-term adverse effect to the respective tax bases. Additionally, if a greater need arises for the use of the land, the land could be converted to another use, however, it is not anticipated that such a conversion would be necessary or desirable.

The properties surrounding the new transportation facility as well as the existing Route 220 may increase in value, as a result of the improved access and mobility offered by the Build Alternative improvements, and would remain taxable land. Between approximately 541 to 584 acres of undeveloped land or land designated for agricultural, residential, commercial, industrial, public, or institutional use may be permanently altered. As part of this permanent land alteration, approximately 264 to 346 acres of farmland, 20,548 to 28,988 linear feet of streams, and 3.7 to 7.8 acres of wetlands have the potential to be affected, depending on the alternative. Although farmland properties could be developed elsewhere, these individual acres would be lost from production. Likewise, while stream and wetland mitigation banking could account for some of these losses, these individual distinct ecosystems could be irreversibly impacted.

Gasoline and diesel fuels to power construction equipment and vehicles would be irretrievably expended during the construction of any one of the alternatives retained for detailed evaluation. In addition, electricity, labor, and highway construction materials would be required. Anticipated construction materials would include, but are not limited to, aggregates, asphalt, bituminous pavement, cement, gravel, and sand. The fuels, electricity, and labor required to manufacture, transport, and apply these materials would be irretrievably lost. However, these construction materials are readily available and their use would not have an adverse effect upon the continued availability of these resources.

The construction of any improvements that may advance from the Martinsville Southern Connector Study would require a considerable expenditure of fiscal resources to pay for the labor and materials, which would also be an irreversible and irretrievable commitment of monetary resources, ranging from an estimate of approximately $757.3 to $615.9 million depending on the alternative. In addition to the costs of construction and right of way, costs would increase for the maintenance of transportation facilities, such as the roadway, bridges, tunnels, signs and markers, electrical systems, and stormwater facilities.

The commitment of these resources is based on the concept that residents in the immediate area, region, and state would benefit from the improved quality of the transportation system. These benefits would consist of improved mobility for regional traffic, enhanced access for local traffic, and improvements to existing geometric deficiencies and inconsistencies, as described in **Chapters 1 and 2** of this Draft EIS, which are expected to outweigh the commitment of these irreversible and irretrievable resources.

3.15 PERMITS AND APPROVALS

This Draft EIS is intended to provide decisionmakers and the public with information regarding the potential environmental effects associated with the implementation and operation of Build Alternative improvements that may advance from the Martinsville Southern Connector Study. In addition to NEPA compliance, a number of permits and approvals would also be obtained or coordinated prior to the construction of any improvements. As part of the OFD process, the following steps are anticipated to complete the synchronized Federal environmental review process and allow VDOT to advance with more detailed design and procurement activities when funding is available.

- Section 404 JPA Completeness Determination – Mid 2020
- Official Notice of Availability of a Final EIS published in the Federal Register – Late 2020
- FHWA Issuance of a ROD[48] – Early 2021
- Section 404 Final Verification/Permit Decision Rendered – Early 2021

The following sections provide a summary of permits, approvals or consultation requirements, including the Federal milestones outlined above as part of the OFD process, that are required as part of the NEPA process or prior to the commencement of construction activities for any improvements that advance from the Martinsville Southern Connector Study.

3.15.1 Final Environmental Impact Statement

Following a formal comment period and receipt of comments from the public and other agencies on this Draft EIS, a Final EIS will be developed and issued. Consistent with the CEQ's implementing regulations (40 CFR §1502.9) for the National Environmental Policy Act of 1969, as amended (NEPA) and FHWA's NEPA regulations (23 CFR §771.125), the Final EIS will discuss substantive comments on the Draft EIS and identify and describe the Preferred Alternative, including any refinements or additional analyses in consideration of comments received. The Final EIS will be made available for public inspection and agency review.

3.15.2 Record of Decision

The ROD is the final step in FHWA's EIS process and may not be issued sooner than 30 days after the approved Final EIS is made circulated for review nor 90 days after the Draft EIS is made publicly available. The ROD identifies the selected alternative, presents the basis for the decision to select that alternative, documents all of the alternatives considered, and summarizes any mitigation measures that will be incorporated as part of the implementation of any selected improvements. Funding for a subsequent phase of the project development process (e.g. detailed design, final design and right of way, or construction) is required to be shown in the Statewide Transportation Improvement Program before FHWA can issue a ROD.

3.15.3 Section 4(f) Approval

Section 4(f) of the U.S. Department of Transportation Act of 1966 prohibits FHWA and other Federal transportation agencies from approving the use of public parks and recreation lands, wildlife and waterfowl refuges, and historic sites, unless a determination is made that:

a) There is no prudent and feasible avoidance alternative to the use of land from the property and the selected action includes all possible planning to minimize harm to the property resulting from such use; or

b) The use, including any measures to minimize harm (such as avoidance, minimization, mitigation, or enhancement measures) will have a *de minimis* impact on the property.

Once the public has had an opportunity to review and comment on the identification of the Preferred Alternative, if the potential remains for use or *de minimis* impacts to resources protected under Section 4(f), FHWA will be required to approve the Section 4(f) Evaluation associated with the Martinsville Southern Connector Study (see **Appendix A: Section 4(f) Evaluation**).

3.15.4 Section 106 – Programmatic Agreement

Section 106 of the NHPA of 1966 (as amended) (54 U.S.C. §306108) and its implementing regulations (36 CFR §800) require Federal agencies to take into account the effects of their undertakings on historic properties, which are defined as buildings, structures, sites, districts and objects, generally at least 50 years of age, that are listed on or eligible for listing on the NRHP.

[48] Funding for a subsequent phase of the project development process will be identified prior to FHWA's issuance of a ROD.

Once the public has had an opportunity to review and comment on the identification of the Preferred Alternative, VDOT and FHWA will assess the effects of the Preferred Alternative on architectural historic properties and coordinate the findings with the SHPO and other Section 106 consulting parties. Should any of the architectural historic properties be adversely affected, FHWA and VDOT will consult with the SHPO and other parties to the Section 106 process to determine appropriate measures that would avoid, minimize, or mitigate the adverse effects. These measures would constitute commitments that would be incorporated as stipulations in a legally binding agreement document executed by the FHWA, the SHPO, the ACHP, VDOT, and other parties as appropriate to conclude the Section 106 process. Presently, VDOT and FHWA anticipate that the agreement document would take the form of a Programmatic Agreement that would also stipulate the process VDOT would follow to complete efforts to identify archaeological historic properties potentially affected by the selected alternative, assess the undertaking's effect on those sites, and identify measures that would resolve any adverse effects by avoiding, minimizing, or mitigating for them.

3.15.5 Section 404 – Dredge and Fill Permit

Section 404 of the CWA regulates activities that may affect the chemical, physical, or biological integrity of Waters of the U.S. Permits for activities that result in the discharge of dredged materials or fill into jurisdictional waters are administered by USACE. Permits issued under Section 404 of the CWA are required to comply with the Section 404(b)(1) Guidelines developed by EPA. In Virginia, for permitting involving water, wetlands, and streams where fill, flooding, or alteration of flow occurs, USACE, VMRC, and VDEQ use a joint project review and permitting process. Impacts to non-tidal resources use a Standard JPA form to document regulated activities. The JPA is submitted to VMRC who then distributes it to USACE and VDEQ, as applicable. Following the receipt of public comments on the Draft EIS, VDOT would advance permit applications for the Preferred Alternative, including any necessary refinements, in order to meet OFD timelines.

3.15.6 Virginia Water Protection Permit

The Virginia Water Protection Permit (VWPP) Program was designed to protect surface waters, including tidal and non-tidal water bodies and wetlands. VDEQ has regulatory authority over most activities affecting these waters. Virginia's authority to protect water resources is independent of other state and Federal regulatory agencies. Authority to enact VWPP regulations is given by Section 62.1-44.15:20 of the Code of Virginia. The over-arching regulation for the permit program is the VWPP Program Regulation, 9VAC25-210. Impacts to water resources would require a JPA to regulatory agencies. The JPA is submitted to VMRC who then distributes it to USACE and VDEQ.

3.15.7 Subaqueous Stream Bed Bottom Permit

Subaqueous land is defined in Virginia as ungranted beds of the bays, rivers, creeks, and shores of the sea owned by the state. Through this regulatory framework, activities requiring permits include building, dumping, or otherwise trespassing upon or over, encroach upon, take or use any material from the beds of the bays, oceans, and jurisdictional rivers, streams, or creeks. VMRC issues permits for activities in, on, or over subaqueous lands in Virginia (Code of Virginia Section 28.2-1203). Impacts to these water resources would require a JPA to VMRC.

3.15.8 Section 401–Water Quality Certification

Section 401 of the CWA states that "any activity including, but not limited to, the construction or operation of facilities, which may result in any discharge into the navigable waters, shall provide the licensing or permitting agency a certification from the state in which the discharge originates or will originate, or, if appropriate, from the interstate water pollution control agency having jurisdiction over the navigable waters at the point where the discharge originates or will originate." Section 401 of the CWA requires any applicant for a Federal license or permit for any activity that may result in a discharge into waters to obtain a certification that discharge will not adversely affect water quality from the state in which the discharge will occur. Section 401 requires certification by VDEQ that prospective permits comply with the state's applicable effluent limitations and water quality standards.

3.15.9 Virginia Pollutant Discharge Elimination System Construction General Permit

The Clean Water Act (CWA), Section 402, requires all point source discharges of pollutants to waters of the United States to obtain a National Pollutant Discharge Elimination System (NPDES) permit from either the U. S. Environmental Protection Agency (EPA) or a state authorized to issue the NPDES permit. During design, a Virginia Pollutant Discharge Elimination System (VPDES) General Permit for Discharges of Stormwater Associated with Construction Activities (VAR10) would be obtained and a Stormwater Pollution Prevention Plan (SWPPP) would be prepared to address water quality and quantity and would be prepared prior to submitting the Registration Statement, per 9VAC25-880. Approvals of stormwater management plans will be obtained from VDEQ, pursuant to obtaining NPDES permits. Stormwater management plans will be developed in in accordance with the DCR-approved VDOT SWM annual specifications.

3.15.10 Endangered Species Act Consultation

Threatened and endangered species are protected primarily by the Endangered Species Act of 1973, as amended (16 U.S.C §1531-1543 et seq. and 50 CFR §17; §402). The USFWS and NOAA - NMFS regulate and protect Federally listed threatened and endangered species under the Endangered Species Act with the primary goal of conserving and recovering listed species. The Endangered Species Act, with few exceptions, prohibits activities affecting threatened and endangered species unless authorized by a permit. Further consultation and final Section 7 effect determinations would be conducted with applicable Federal and state resource agencies, including the USFWS, VDGIF and VDCR, during the Section 404, 401, and VMRC permitting processes.

CHAPTER 4

List of Preparers

4. LIST OF PREPARERS

This Draft Environmental Impact Statement was prepared by the Federal Highway Administration and the Virginia Department of Transportation with support from a study team of consultant engineers and planners. Key preparers of this document are listed as follows:

Federal Highway Administration

Mack Frost
Environmental Specialist
Education: MS Public Health, BA Communications
Professional Experience: 10 years
Role: FHWA NEPA Project Manager

Virginia Department of Transportation

Angel Aymond
Location Studies Project Manager
Education: MS Public Policy, BA Anthropology
Professional Experience: 4 years
Role: Project Manager

Angel Deem
Environmental Division Director
Education: BS Biology
Professional Experience: 22 years
Role: NEPA Review and Agency Coordination

Peng Xiao, PE, PTOE, PMP
Modeling and Accessibility Program Manager
Education: MS Transportation Engineering
Professional Experience: 14 years
Role: Traffic and Transportation Technical Review

Michael Gray
Salem District Planning Manager
Education: MA Transportation Policy, Operations and Logistics, BS Urban and Regional Planning
Professional Experience: 27 years
Role: Agency and Public Coordination

Scott Smizik, AICP
Location Studies Project Manager
Education: MS Energy and Environmental Policy, BA Environmental Studies
Professional Experience: 17 years
Role: Project Manager

Ben Mannell, AICP
Assistant Director of Transportation Planning
Education: MS Planning, BS Planning
Professional Experience: 22 years
Role: Traffic and Transportation Technical Review

Thomas DiGiulian, PE
Salem District Project Development Engineer
Education: BS Civil Engineering
Professional Experience: 29 years
Role: Agency and Public Coordination

Alex Price, PE
Salem District Location and Design Engineer
Education: BS Industrial Engineering, BS Civil Engineering
Professional Experience: 25 years
Role: Engineering and Design Technical Review

Lisa Hughes, PE
Martinsville Residency Engineer
Education: BS Civil Engineering
Professional Experience: 34 years
Role: Agency and Public Coordination

Tony Opperman
Cultural Resources Preservation Program Manager
Education: MA Anthropology, BA Anthropology
Professional Experience: 36 Years
Role: Cultural Resources Review

David L. Wilson
Environmental Compliance Program Manager
Education: MS Environmental Science, BSE Applied Science
Professional Experience: 13 years
Role: Hazardous Materials Technical Review

LJ Muchenje, PE, PMP
Senior Highway Noise Specialist
Education: BS Mechanical Engineering
Professional Experience: 12 years
Role: Noise Technical Analysis Review

Susan Alexander
Aquatic Wildlife Biologist
Education: MS Biology – Aquatic Ecology, BS Biology
Professional Experience: 15 years
Role: Natural Resources Technical Review

Amy Golden
Endangered Species Program Manager
Education: BS Environmental Forest Biology
Professional Experience: 15 years
Role: Natural Resources Technical Review

Vernon (Butch) W. Heishman, PE
Roadway Design and Special Projects Program Manager
Education: BS Civil Engineering
Professional Experience: 24 years
Role: Engineering and Design Technical Review

Sarah M. Clarke
Environmental Specialist
Education: MA History/Historic Preservation, BA History
Professional Experience: 19 years
Role: Cultural Resources Technical Lead

James Ponticello
Air Quality/Noise Program Manager
Education: MS Civil/Environmental Engineering, BS Biology, BS Chemical Engineering
Professional Experience: 22 years
Role: Air Quality/Noise Technical Lead

Steven Begg
Natural Resources Program Manager
Education: BS Environmental Science
Professional Experience: 26 years
Role: Natural Resources Technical Review

Dan Redgate
Water Quality Permit Program
Education: MS Marine Science/Wetland Hydrology, BS Ecology
Professional Experience: 23 years
Role: Natural Resources Technical Review

Whitman, Requardt, and Associates, LLP

Nicholas Nies
Associate
Education: MA Transportation Policy Operations and Logistics, BS Health Fitness Park and Recreation Resource Management
Professional Experience: 18 years
Role: Consultant Team Project Manager, Alternatives Technical Documentation, Quality Assurance (QC)/ Quality Control (QC)

Caleb Parks
Senior Project Environmental Planner
Education: BS Environmental Policy and Planning
Professional Experience: 8 years
Role: Consultant Team Deputy Project Manager, NEPA Document Writer, QA/QC

Megan A. Comer
Environmental Planner & GIS Analyst
Education: BS Environmental Policy and Planning, BS Geography – Geospatial and Environmental Analysis
Professional Experience: 3 years
Role: NEPA Document Writer, Socioeconomics, Environmental Justice, and Land Use Technical Documentation, QA/QC

Emily Drahos
Environmental Scientist
Education: BS Environmental Science, MS Natural Resources Management
Professional Experience: 6 years
Role: Natural Resources Technical Documentation

Joe Felton
Senior Project Environmental Scientist
Education: BS Forestry-Environmental Resource Management
Professional Experience: 18 years
Role: Consultant Team Permitting Manager, Natural Resources Technical Documentation

John Maddox, P.E.
Senior Vice President
Education: BS Civil Engineering
Professional Experience: 32 years
Role: Alternatives Technical Documentation

Kimberly Glinkin, AICP
Associate
Education: MA Environmental Studies, BA Economics
Professional Experience: 29 years
Role: NEPA Document Writer, Indirect and Cumulative Effects Technical Documentation, QA/QC

Joshua Kozlowski
Senior Project Environmental Planner
Education: BS Geophysics
Professional Experience: 19 years
Role: Noise Technical Documentation

Ralph Tuck II
Environmental Scientist
Education: BS Environmental Science
Professional Experience: 5 years
Role: Natural Resources Technical Documentation

Taylor Sprenkle
Associate
Education: MS Biology, BS Biology
Professional Experience: 19 years
Role: Natural Resources Technical Documentation

Dana Trone, PE, PTOE
Senior Vice President
Education: BS Civil Engineering
Professional Experience: 22 years
Role: Traffic Analysis Technical Documentation, QA/QC

Andrew Koser, PE
Associate Engineer
Education: BS Civil Engineering
Professional Experience: 16 years
Role: Alternatives Technical Documentation

Wallace Montgomery and Associates

Ray Moravec, PE
Associate
Education: BS Civil Engineering
Professional Experience: 28 years
Role: Consultant Project Manager-Alternatives, Traffic, Air, Noise

Jessica Klinefelter, CEP
Associate
Education: MS Wildlife Biology, BS Biology
Professional Experience: 21 years
Role: Project Management, EIS and Technical Reports

Russ Anderson, PE
Transportation Planner
Professional Experience: 20 years
Role: Alternatives Development

Seth Darlington, PE
Transportation Planner
Education: BS Civil Engineering
Professional Experience: 13 years
Role: Alternatives Development

Nick Alexandrow
Traffic Engineer
Education: MS Business Management, BS Civil Engineering
Professional Experience: 18 years
Role: Traffic Analysis

Nick Walls, AICP, GISP
GIS Manager
Education: MS Environmental Science, BS Environmental Science,
Professional Experience: 17 years
Role: GIS

Jade Miller
Environmental Scientist
Education: BS Environmental Science
Professional Experience: 3 years
Role: Social and Natural Resources Technical Analysis

Scot Aitkenhead, PWS
Senior Environmental Scientist
Education: MS Environmental Science, BS Environmental Science
Professional Experience: 19 years
Role: Wetland and Waterways Delineation, Natural Resources Technical Analysis

Angela Rabjohn
Transportation Planner
Education: BA Engineering
Professional Experience: 1 year
Role: Alternatives Development

Charles Kenny
Transportation Planner
Education: MBA International Business, BS Civil Engineering
Professional Experience: 11 years
Role: Alternatives Development

Louis Maggio
Transportation Engineer
Education: BS Civil Engineering
Professional Experience: 5 years
Role: Alternatives Development

Elsie Boone
Environmental Scientist
Education: BS Environmental Science
Professional Experience: 3 years
Role: Natural Resources and NEPA Documentation

Jacobs

Stephen Weller
Travel Demand Forecaster
Education: ME Civil Engineering, BS Civil Engineering
Professional Experience: 22 years
Role: Traffic Forecasting

Nazneen Ferdous
Travel Demand Modeler
Education: Ph.D. Civil Engineering
Professional Experience: 8 years
Role: Travel Demand Model

Kristi Kucharek
Senior Environmental Planner
Education: BS Geoenvironmental Studies
Professional Experience: 19 years
Role: Indirect and Cumulative Effects

William Tardy
Environmental Planner
Education: MS Urban Planning, BS Plant Biology
Professional Experience: 9 years
Role: Indirect and Cumulative Effects

Ramgiridhar (Giri) Kilim, PE, PTOE
Senior Transportation Engineer
Education: MS Civil Engineering, BE Civil Engineering
Professional Experience: 17 years
Role: Environmental Traffic Data Analysis

WSSI

Benjamin N. Rosner, PWS, PWD, CE, CT
Manager – Environmental Science
Education: MS Natural Resources, BS Biology
Professional Experience: 17 years
Role: Project Management and Natural Resources Technical Documentation Review

Alexi J. Weber, WPIT
Environmental Scientist
Education: BS Biology
Professional Experience: 6 years
Role: Field Studies Management and Natural Resources Technical Documentation

Jennifer M. Favela, PWS
Project Environmental Specialist
Education: BS Marine Biology
Professional Experience: 7 years
Role: Field Studies Management and Natural Resources Technical Documentation

3e

Suzanne Richert, AICP, CEP
Senior Environmental Scientist
Education: MS Soil Science, BS Agronomy
Professional Experience: 18 years
Role: QA Review, NEPA Document Writer

Chris Lalli
Vice-President
Education: BS Environmental Science
Professional Experience: 20 years
Role: Hazardous Materials

Doug Fraser
Senior Vice-President
Education: MS Geological Science,
BS Geology
Professional Experience: 41 years
Role: QA Review and Hazardous Materials
Technical Analysis

HMMH

Phillip Devita
Senior Air Quality Analyst
Education: MS Environmental Studies,
BS Meteorology
Professional Experience: 30 years
Role: Lead Air Quality

Emma Butterfield
Noise Analyst
Education: BS in Environmental Science
Professional Experience: 1 year
Role: Noise Measurements and Data
Collection, Modeling and Analysis, GIS

Chris Menge
Senior Noise Analyst
Education: BS in Physics
Professional Experience: 46 years
Role: Senior Technical Advisor,
Documentation, QA/QC

Chris Bajdek
Noise Analyst
Education: BS in Mechanical Engineering
Professional Experience: 28 years
Role: Lead Noise Analysis, QA/QC,
Documentation

Hayden Jubera
Noise Analyst
Education: BS, Acoustics
Professional Experience: 4 years
Role: Noise Measurements and Data
Collection, Modeling and Analysis

Michael Hamilton
Senior GIS Analyst
Education: BS Cartography & Geographic
Information Systems, AS Survey & Highway
Engineering Technology
Professional Experience: 18 years
Role: GIS

AECOM

Pete Regan
Principal Investigator/Senior
Archaeologist/Senior Historian
Education: MA Historic Archaeology,
BA Anthropology
Professional Experience: 14 years
Role: Cultural Resources

Sarah Potere
Architectural Historian
Education: MS Historic Preservation, BA
Historic Preservation
Professional Experience: 3 years
Role: Cultural Resources

Heather Crowl
Principal Investigator/Archaeology
Professional Experience: 22 years
Role: Cultural Resources

Cultural Resource Analysts, Inc.

Alyssa Reynolds
Architectural Historian
Education: MS Historic Preservation, BA Archaeology
Professional Experience: 4 years
Role: Cultural Resources

Nicholas Arnhold
Principal Investigator - Archaeology
Education: MA Anthropology, BA Anthropology
Professional Experience: 6 years
Role: Cultural Resources

Matthew Fuka
Field Supervisor - Archaeology
Education: MS Anthropology, BA Anthropology
Role: Cultural Resources

Virginia Tech – Department of Fish and Wildlife Conservation

Paul Angermeier
Assistant Unit Leader, Virginia Cooperative Fish and Wildlife Research Unit
Education: PhD Ecology, MS Ecology, BS Environmental Science
Professional Experience: 37 years
Role: Fish Habitat Assessments

Richard Neves
Professor Emeritus
Education: PhD Fisheries, MS Zoology, BS Zoology
Professional Experience: 41 years
Role: Mussel Habitat Assessments

CHAPTER 5

Distribution List

5. DISTRIBUTION LIST

The following agencies and organizations were provided printed or electronic copies of the Draft Environmental Impact Statement for the Martinsville Connector Study. These agencies either served as Cooperating or Participating Agencies in the study or were considered scoping agencies or non-governmental organizations with a potential interest in the study. Additional information regarding the agencies invited to serve as Cooperating or Participating Agencies is included in **Appendix B: Coordination Plan**.

5.1 FEDERAL AGENCIES

United Stated Department of Agriculture, National Resources Conservation Service

United Stated Department of Agriculture, Forest Service

United States Department of the Interior, National Park Service

National Oceanic and Atmospheric Administration, National Marine Fisheries Service

United States Department of the Interior, Fish and Wildlife Service

United Stated Department of the Interior, Office of Environmental Policy and Compliance

United States Department of Transportation, Federal Railroad Administration

United Stated Army Corps of Engineers

United States Environmental Protection Agency

United States Coast Guard, Fifth District

United States Department of Homeland Security, Federal Emergency Management Agency

United States Department of Housing and Urban Development

Advisory Council on Historic Preservation

5.2 COMMONWEALTH OF VIRGINIA AGENCIES

Virginia Department of Agriculture and Consumer Services

Virginia Department of Conservation and Recreation

Virginia Department of Historic Resources

Virginia State Police Department

Virginia Department of Game and Inland Fisheries

Virginia Marine Resources Commission

Virginia Department of Environmental Quality

Virginia Department of Historic Resources

Virginia Department of Health

Virginia Department of Forestry

Virginia Department of Housing and Community Development

Virginia Department of Mines, Minerals, and Energy

Virginia Department of Emergency Management, VDEM Region 6

Virginia Department of Rail and Public Transportation

5.3 COUNTY AND CITY AGENCIES

Henry County

City of Martinsville

Town of Ridgeway

5.4 OTHER ORGANIZATIONS

West Piedmont Planning District Commission

North Carolina Department of Transportation

CHAPTER 6

Comments & Coordination

6. COMMENTS AND COORDINATION

6.1 INTRODUCTION

In coordination with the Federal Highway Administration (FHWA), the Virginia Department of Transportation (VDOT) has conducted an extensive outreach and engagement effort with Federal, state, regional, and local agencies, in addition to interested stakeholders and the general public, throughout the duration of the study. At the initiation of the study, a Coordination Plan was developed, in accordance with the requirements defined in 23 U.S.C. §139(g). The purpose of the plan was to establish the timing and format for facilitating structured scheduled interaction with the public and agencies during the study process to ensure adequate opportunities for participation in the development of the Purpose and Need, identification of the range of alternatives, and identification of environmental issues.

The establishment of the Coordination Plan is also consistent with the stipulations of the merged process, described in **Chapter 1: Purpose and Need**. The merged process calls for a structured environmental review with established timeframes, early agency communication, and strategic public involvement, to ensure sufficient information and documentation is provided to support FHWA approval or Federal regulatory decision-making.

The agency coordination and public involvement that has occurred as part of the study is summarized in the subsequent sections.

6.2 AGENCY COORDINATION

6.2.1 Scoping

Initial input on the Draft Environmental Impact Statement (EIS) and the consideration of alignment options for the Route 220 corridor within the study area began when FHWA and VDOT issued a Notice of Intent to prepare an EIS for potential roadway improvements between the North Carolina state line and Route 58 near Martinsville, Virginia. Pursuant to 40 CFR §1501.7, the NOI was published in the Federal Register on February 22, 2018 (83 Fed. Reg. 7841, 2018).

Following the issuance of the NOI, FHWA and VDOT distributed scoping letters to the agencies and organizations identified in **Chapter 5: Distribution List**, requesting input on the identification of transportation needs as well as human and environmental resources related to the study and to ensure that a full range of relevant factors were considered and addressed in the Martinsville Southern Connector Study. Consistent with 40 CFR §1501.7(b)(4), VDOT also hosted an Agency Scoping Meeting in Richmond, Virginia on April 11, 2018, which was integrated into VDOT's regularly scheduled monthly National Environmental Policy Act (NEPA) study coordination meeting. The meeting was also broadcasted for remote users via telephone and internet conferencing.

The intent of the scoping outreach was to introduce the study to Federal, state, and local agencies; discuss the study process/approach, schedule, and agency involvement; and identify key constraints or issues that should be considered. As part of the scoping process, FHWA and VDOT identified and invited Cooperating and Participating Agencies to be involved in the study development process. Upon confirming agency roles and responsibilities, there have been monthly meetings held with the Cooperating and Participating Agencies to keep these agencies and organizations informed and to seek appropriate input at certain decision points along the development of the study.

6.2.2 Cooperating Agencies

According to the Council of Environmental Quality's (CEQ) regulations (40 CFR §1508.5) and consistent with FHWA guidance (FHWA 1992), a Cooperating Agency is defined as any agency, other than a Federal Lead Agency, that has jurisdiction by law or special expertise with respect to any environmental impact involved in the study. CEQ regulations (40 CFR §1501.6) permit a Cooperating Agency to assume on request of the Lead Agency responsibility for developing information and preparing environmental analyses including portions of the environmental impact statement concerning which the Cooperating Agency has special expertise. An additional distinction is that, pursuant to 40 CFR §1506.3, a Cooperating Agency may adopt the environmental impact statement of a Lead Agency for their own respective Federal actions and approvals when, after an independent review of the statement, the Cooperating Agency concludes that its comments and suggestions have been satisfied. This provision aligns with the intent of the One Federal Decision (OFD) process and is particularly important to permitting agencies, such as the USACE, who, as Cooperating Agencies, routinely adopt USDOT environmental documents. Agencies that have been invited to serve and accepted the role of Cooperating Agencies for the Martinsville Southern Connector Study include USACE and EPA, as previously mentioned. A complete list of agencies invited to be Cooperating Agencies for the study are included in the Coordination Plan (**Appendix B**).

6.2.3 Cooperating (Concurring) Agencies

Federal agency signatories of the merged process that accepted an invitation to serve as a Cooperating Agency were considered to be Concurring Agencies. Concurring Agencies provide input as well as concurrence or non-concurrence on specific steps throughout the environmental review, which are outlined in the merged process. These steps, or concurrence points, include the following:

- Scoping and environmental analysis methodologies;
- Purpose and Need;
- Alternatives development;
- Identification of the recommended preferred alternative; and
- Conceptual mitigation for project impacts.

As Cooperating Agencies party to the merged process, USACE and EPA also accepted the role of Concurring Agency for the Martinsville Southern Connector Study. As Cooperating (Concurring) Agencies, USACE and EPA provided their input and concurrence on all the steps of the merged process, as described throughout this Draft EIS.

6.2.4 Participating Agencies

Pursuant to 23 CFR §771.111(d) local, state, regional, and Federal agencies with an interest in the study were invited to serve as Participating Agencies. Participating Agencies provide advice over the course of the study regarding Purpose and Need, potential alternatives, environmental issues, and study methodologies. They also review and comment on environmental documentation to reflect the views and concerns of their respective agencies. A complete list of the Participating Agencies is included in the Coordination Plan (**Appendix B)**. Participating Agencies were allowed the opportunity to provide input at monthly meetings conducted throughout the duration of the Draft EIS development. Input from the Participating Agencies was particularly important to inform the concurrence steps, consistent with the merged process. A complete list of agencies invited to be Participating Agencies for the study are included in the Coordination Plan (**Appendix B**).

6.2.5 NEPA Programs Section Agency Coordination Meetings

Throughout the development of this Draft EIS, regularly scheduled agency coordination meetings were held to provide information, seek feedback and document milestone concurrence points. **Table 6-1** lists the agency meetings, general topics discussed, and any decisions that have been made over the course of the study development process. Meetings were generally conducted in conjunction with VDOT's monthly NEPA Programs Agency Coordination. However, coordination was supplemented by interim meetings and conference calls, as necessary, to convey important information or to solicit agency concurrence at coordination milestones throughout the study process. Intervals between monthly coordination occurred through July and August 2018, while VDOT synthesized supporting data and developed the Purpose and Need for the study; during the summer of 2019, when VDOT's recommendation of the Preferred Alternative had been shared with the agencies and was presented to the public in July and August; and in late 2019, following the receipt of public comments on the Preferred Alternative recommendation and as VDOT prepared to present the recommendation to the Commonwealth Transportation Board (CTB) in December 2019.

Table 6-1: Overview of Agency Coordination Meetings

Meeting Date	Year	Meeting Summary	Decisions Made
April 11	2018	Study initiation; agency scoping; presented draft Coordination Plan; discussed the Merged NEPA/Section 404 Process.	
May 9	2018	Reviewed agency roles/responsibilities; presented Environmental Analysis Methodologies.	
June 18	2018	Requested concurrence on Environmental Analysis Methodologies; summarized the results of the Citizens Information Meeting (CIM) held on May 8, 2018.	Following the agency meeting, USACE and EPA concurred upon the Environmental Analysis Methodologies, with input from US Fish and Wildlife Service and other Participating Agencies.
September 12	2018	Introduced the Purpose and Need; discussed upcoming public survey on the needs for the project.	
October 10	2018	Shared results of Purpose and Need survey; continued discussion on Purpose and Need	
November 14	2018	Requested concurrence on Purpose and Need; began discussion on preliminary alignment options.	Concurrence on Purpose and Need received from USACE and EPA.
December 12	2018	Discussed preliminary alignment options under consideration.	
January 9	2019	Continued discussion on preliminary alignment options.	
February 13	2019	Summarized the results of the CIM held January 23, 2019 and initiated discussion of preliminary alternatives to carry forward for evaluation.	
March 13	2019	Requested concurrence on the alternatives carried forward for evaluation (Alternatives A, B, C, D and E).	Concurrence on alternatives carried forward for evaluation received from USACE and EPA.

Meeting Date	Year	Meeting Summary	Decisions Made
April 10		Updated schedule for agency reviews of preliminary technical studies and documentation, based on alternatives carried forward for evaluation, provided discussion of initial findings from the Indirect and Cumulative Effects analysis.	
May 8		Presented preliminary results from wetlands and streams field investigations and potential impacts of the alternatives carried forward; presented preliminary property relocations by alternative and indicated that additional alternatives may be eliminated from further consideration based on preliminary evaluations.	
June 12		Continued discussion of property impacts and recommended to drop Alternatives D and E from consideration. Presented preliminary recommendation of Alternative C as the Preferred Alternative.	No objection to dropping Alternatives D and E from consideration.
August 14		Initiated request for concurrence on the identification of the Preferred Alternative (Alternative C), based on anticipated impacts and preliminary cost estimates. Requested concurrence on conceptual mitigation for unavoidable impacts.	
September 4		Coordination call to follow up on request for concurrence on the identification of the Preferred Alternative and conceptual mitigation; provided supplemental information to support concurrence requests.	Concurrence on the identification of the Preferred Alternative and conceptual mitigation received from USACE and EPA.
September 11		Workshop meeting to focus on permitting needs as the study advance through the OFD process; provided overview of draft Joint Permit outline and preliminary schedule for permitting activities.	
October 9		Coordination call to provide a status update to the agencies involved in the study development. Discussion included a summary of public comments on the Preferred Alternative and an overview of upcoming schedule activities.	
January 8	2020	Provided overview of concurrence milestones and upcoming study timeframes, with a specific focus on future permitting activities.	
February 12		Introduced permitting assumptions for agency review as the study advances through the OFD process.	

6.2.6 Section 106 Consulting Parties

The implementing regulations for Section 106 of the National Historic Preservation Act (36 CFR §800.2(c)(3)) entitle a representative of a local government, with jurisdiction over the area in which the effects of an undertaking may occur, to participate in the Section 106 process as a Consulting Party. Consulting Parties are those governmental agencies, Indian tribes, organizations, and individuals with a demonstrated interest in the study who provide comment to the Federal agency (FHWA) and its agent (VDOT) on their efforts to identify and assess potential project effects on historic properties and identify appropriate means to avoid, minimize, or mitigate any adverse effects. Pursuant to Section 106 [36 CFR 800.3(f)], VDOT, in coordination with FHWA, reached out by letter to the following parties to determine whether they wished to participate in Section 106 consultation on the Martinsville Southern Connector Study:

36 CFR §800.2(c)(2) Indian Tribes and Native Hawaiian Organizations

- Pamunkey Tribe
- Chickahominy Indian Tribe
- Chickahominy Indian Tribe – Eastern Division
- Upper Mattaponi Indian Tribe
- Nansemond Indian Tribal Association
- Catawba Indian Nation
- Delaware Nation

36 CFR §800.2(c)(3) Representatives of Local Governments

- Henry County
- City of Martinsville
- Town of Ridgeway

36 CFR §800.1(c)(5) Additional Consulting Parties

- Martinsville-Henry County Historical Society
- Bassett Historical Center
- Preservation Virginia

Of these invited parties, the Martinsville-Henry County Historical Society responded to confirm its interest in participating in Section 106 consultation. As a Consulting Party in the Section 106 process, the Martinsville-Henry County Historical Society was provided an opportunity to review and comment on the ***Architectural History Survey*** (VDOT, 2020i) and the ***Phase I A Archaeological Survey*** (VDOT, 2020h). These documents included the identification of historic properties. VDOT's assessments of the Preferred Alternative's effects on architectural historic properties were provided to the State Historic Preservation Officer and other consulting parties is expected to be coordinated in October 2019 (**Appendix C)**. Consulting parties will be involved in the preparation of a Memorandum of Agreement (MOA) or Programmatic Agreement (PA), should one be prepared at the conclusion of the Section 106 process.

6.3 PUBLIC INVOLVEMENT

A public involvement program was developed to ensure that concerned citizens, interest groups, civic organizations, and businesses had adequate opportunities to express their views throughout the environmental review process. Following are the objectives of the public involvement strategy:

- Educate and engage stakeholders;
- Disseminate information about the study;
- Create awareness for future public participation efforts;
- Solicit stakeholder input to inform decision makers as they identify the Preferred Alternatives;

- Provide methods and mechanisms to address stakeholder issues and to ensure two-way communication, as needed.

Various communication media, including print, website, email, and social media, were used to provide information about the study and gather input from citizens and other interested parties.

6.3.1 Public Outreach Program

A variety of outreach techniques and materials were used to inform citizens and other interested parties about the details of the study and to solicit their comments and concerns. Specific tools used to notify the public and engage them in the study process are described below.

6.3.1.1 Study Website and Email

A website was developed to provide information to the public concerning the status of the EIS process, which was updated several times throughout the study process. The website (www.virginiadot.org/martinsvilleconnector) includes information on the study background, the environmental review process, alternatives considered in the study, a tentative schedule, and information from previous public meetings. The study website also includes electronic versions of study newsletters, public meeting displays, and other study documents. Contact information was also provided as additional means for citizens to comment and study-specific email addresses were developed (martinsville220@vdot.virginia.gov).

6.3.1.2 Newsletters

Monthly study newsletters were prepared during the course of the development of the Draft EIS to keep interested parties informed about the status and progress of the study. Topics discussed in these newsletters included the study history, the study process, opportunities for public participation, the study's Purpose and Need, alignment options and alternatives, and results of the initial environmental screening. Each newsletter also provided the link to the study website and next steps. The newsletters were emailed to all individuals; organizations; and Federal, state, and local agencies on the study email list, and were made available at public meetings. These newsletters were distributed via email and remain available on the study website.

6.3.1.3 Online Surveys

VDOT launched an online survey as part of the public outreach effort to gather input from the public regarding the study. Between September 10, 2018 and October 10, 2018, the online survey was available for the public to participate. The survey was advertised through a press release, social media advertisements, and a post card mailing to addresses within the zip codes surrounding the study area. At the end of the survey period, there were 775 participants and hundreds of comments on transportation issues regarding Route 220. The survey asked participants questions about how and why they use Route 220 as well as asking participants to give feedback on how to improve travel within the corridor.

In January 2019, as part of the CIM, VDOT conducted an online survey, in addition to the comment forms provided at the meeting. To announce the meetings and advertise the survey, VDOT administered press releases and utilized the study website, post card mailers, newsletters, social media, and email listserv. A total of 50 online survey comment forms were received in addition to written comments received by those who attended the CIM. Questions asked included, "Which alignment option do you like most and why?"; "Which alignment option do you like the least and why?"; and "How did you find out about the meeting?".

VDOT also administered a second online survey between March 1, 2019 and March 31, 2019 to collect data on the impacts of bi-annual race events at Martinsville Speedway. As this survey was intended to solicit specific input related to race traffic, it was advertised in the National Association for Stock Car Auto Racing *Pole Position Magazine* (NASCAR, 2019) and through the email listserv maintained for the study. The survey received 200 responses. Participants provided input on traffic impacts and identified key problem areas resulting from events at the Martinsville Speedway, including nearby exits, Ridgeway interchanges, and from the Speedway to the state line. Eight respondents indicated that events at the Speedway cause minor traffic impacts on Route 220 south of Martinsville, whereas 66 indicated that events caused major problems.

VDOT conducted a third online survey between July 15, 2019 and August 25, 2019 to receive public input on the identified Preferred Alternative for the study. A total of 659 comments were received at the meeting or submitted online, in the mail, or through email.

Additional public outreach and survey efforts are anticipated when the Draft EIS is made available for review and comment. Along with the notification of the Draft EIS being made publicly available, additional surveys and other outreach opportunities will be advertised through press releases, newspaper advertisements, social media, and other outlets.

6.3.2 Citizen Information Meetings

Two CIMs were held in May 2018 and January 2019. These CIMs were conducted in an open house format, and offered an opportunity for interested stakeholders, business owners and residents to learn more about the study and participate in the environmental review process. VDOT staff and project consultants were present at the workshops to answer questions and explain the study process and technical issues.

The meetings were advertised in the following local newspapers: Martinsville Bulletin and Henry County Enterprise. Also, to announce the meetings, VDOT administered press releases and meetings were also advertised using the study website, post card mailers, newsletters, and email listserv. Social media ads, geographically targeted to the region surrounding the study area, were used to promote the online survey for the CIM information to the public.

A description of each workshop purpose and summary of public comments follows.

6.3.2.1 Citizen Information Meeting #1 – May 8, 2018

The first CIM to discuss the Martinsville Southern Connector Study was held on Tuesday, May 8, 2019 from 4:30 p.m. to 6:30 p.m. at Magna Vista High School in Martinsville. The purpose of the meeting was to introduce the study to the public and collect comments and receive input on any transportation issues and social, economic, and natural environmental resources attendees felt were important to the Route 220 corridor and surrounding areas.

The meeting was attended by 11 members of the public. Informational boards were displayed, containing various study maps, a study schedule, and a board on the EIS process and other relevant information. The public was given an opportunity to draw and write on maps, showing locations in the study area where they wanted to provide input. A table was also set up for the public to fill out comment sheets, which could also be taken home and returned at a later date. A court reporter was present to record verbal comments from attendees. VDOT's Project Manager gave a brief PowerPoint presentation, providing an overview of the study purpose and process.

Meeting attendees discussed the need to improve the open flow of traffic on Route 220, a desire to straighten existing roadway curves, and improve access to homes, businesses, and race traffic.

The public also provided map feedback to help identify transportation issues along the route. The southern end of Route 220 was a greater concern than the northern end. Residents suggested adding an access point to the Commonwealth Crossing Business Centre in Virginia as the only current entrance is where Route 220 passes the North Carolina state line and intersects with Spencer Road. Residents also depicted high accident crash locations: southbound lanes of the southern end of Route 220 at the Route 689 (Reservoir Road) intersection and the intersection at Route 688 (Lee Ford Camp Road). Citizens also mentioned that the stretch of Route 220 from the North Carolina state line to Ridgeway is a high crash area. It was also suggested that a right turn lane be added along southbound Route 220 for improved access to the houses and apartments near the Reservoir Road intersection.

Comments were submitted either through mail, email, or at the meeting. In total, there were 13 comments submitted during the comment period. Some of the comments mentioned the need for safer speeds, wider shoulders, and better access to businesses, homes, and interstate highways. Nine of the comment cards expressed safety concerns along Route 220; four cards specifically mentioned the need to eliminate or straighten the horizontal curves. Another safety concern cited was the signalized intersection of Route 687 (Soapstone Road)/Route 220. Residents were concerned about local students crossing at this location and the high speed of passing vehicles. Eight comment cards listed either newspaper advertisement or news story as the way they heard about the meeting.

6.3.2.2 Citizen Information Meeting #2 – January 23, 2019

The second CIM was held on Wednesday, January 23, 2019 from 6:00 p.m. to 8:00 p.m. at Drewry Mason Elementary School in Ridgeway. The purpose of the meeting was to provide information to the public regarding study goals and the alignment options under consideration.

The meeting utilized an open-house format where no formal presentation was given. The meeting was attended by 43 members of the public. Informational boards were displayed, containing various study maps, a study schedule, information on the EIS process, Purpose and Need statement, online survey results, and alignment options.

The public was given the opportunity to review and comment on alignment options before, during, and after the meeting. Meeting attendees discussed their preferred alignment options, concerns for safety along the corridor, and traffic from the south. Of 30 comment cards, nine indicated that Alignment Option 4A was favored due to potentially meeting the stated Purpose and Need, having less anticipated property impacts, having less anticipated environmental impacts, and having a lower anticipated cost. Of 30 comment cards, 11 indicated that Alignment Option 5C was liked the least due to reasons such as having greater anticipated property impacts, greater anticipated environmental impacts, higher anticipated cost, and not meeting the stated Purpose and Need. Of the comments received, 16 of 30 comment cards listed the study website as the way they heard about the meeting.

A total of 50 online survey comments were received based on the information provided online showing the meeting content. Of the 50 comments received, 13 indicated then liked alignment option 4C the most, mostly due to meeting the Purpose and Need and anticipated cost. The No-Build option was identified as liked the least with 13 responses, with Alignment Option 4C second with ten responses. Reasons for not liking the alignment options were related to not meeting the Purpose and Need and anticipated property impacts.

The materials for this meeting were available in Spanish language. Presentations from this meeting were also published with Spanish language captioning available.

6.3.3 Public Hearings

6.3.3.1 Public Hearing on Recommended Preferred Alternative – August 15, 2019

A Public Hearing on VDOT’s recommendation of the Preferred Alternative was held on Thursday, August 15, 2019 from 5:00 p.m. to 7:00 p.m. at Drewry Mason Elementary School in Ridgeway. Consistent with §33.2-208 of the Code of Virginia and the policies and regulations of the CTB, including Chapter 24 of the Virginia Administrative Code 30-380-10, the Public Hearing was held to provide an opportunity for the public to participate in the CTB’s decision on the route location or possible location for any improvements that may advance from the Martinsville Southern Connector Study.

Written notice of the time and location of the Public Hearing was published in the local newspaper and advertised through the distribution of post card mailers, electronic mailings, online newsletters, and social media notifications. The Public Hearing utilized an open-house format where no formal presentation was given. There were 13 display boards, a summary brochure, and VDOT staff available to discuss any of the materials or answer questions. The public was afforded the opportunity to obtain information on the detailed evaluation of the Build Alternatives as well as other pertinent study information regarding VDOT's recommendation of the Preferred Alternative. Materials for the Public Hearing, including a virtual presentation as well as a survey on VDOT's recommendation, were placed on the study website one month prior to the hearing. The materials for this meeting were available in Spanish language. Presentations from this meeting were also published with Spanish language captioning available. The information brochure for was fully translated to Spanish and made available on the study website.

There were 300 attendees at the Public Hearing and a total of 659 comments were received at the meeting or submitted online, in the mail, or through email as part of the formal comment period. Many commenters expressed a need for improvements within the Route 220 corridor, but voiced concerns about potential impacts, including 129 commenters that voiced concerns about property impacts in addition to others that expressed concerns about potential increased noise and changes to traffic patterns.

6.3.3.2 Public Hearing – March 26, 2020

A second Public Hearing is planned for March 26, 2020 to present the findings of the Draft EIS and associated technical documentation, to provide a discussion forum between the public and the study team, and to obtain input and comments from the community. Materials presented at the hearing will be available one month prior to the public hearing on the study website. Consistent with FHWA's regulations for implementing NEPA [23 CFR §771.123(i)], comments on the Draft EIS can be submitted on or before April 20, 2020. The public comment period for the Draft EIS is for a period of 45 days from the notice of availability, which will be posted on the Federal Register and VDOT's website. The public, interested stakeholders, or agencies are invited to provide their input to VDOT electronically using the comment form, email contact, or mailing address found on the study website (www.virginiadot.org/martinsvilleconnector). Comments may also be submitted in writing or by verbal testimony at the Public Hearing. All comments received during the public hearing and comment period will be considered and all substantive comments will be addressed in the Final EIS.

CHAPTER 7

References & Resources

7. REFERENCES & RESOURCES

American Association of State Highway and Transportation Officials (AASHTO). 2011. *A Policy on Geometric Design of Highway and Streets* (Green Book).

American Association of State Highway Officials (AASHO). 1954. A Policy on Geometric Design of Rural Highways. Washington, DC.

Baker, J. C. 2000. Soils of Virginia. Virginia Cooperative Extension.

Blue Ridge Soil and Water Conservation District (BRSWCD). 2018. 2017 - 2018 Annual Report Franklin, Henry, Roanoke Counties & the City of Roanoke. Retrieved from http://brswcd.org/

City of Martinsville Planning Commission. 2009. Martinsville City Comprehensive Plan Update 2009. Retrieved on February 18, 2019 from http://www.martinsville-va.gov/businesses/community-development/comprehensive-plan.

Connecticut Department of Energy and Environmental Protection (CDEEP). 2019. *Daylighting Roads and Trails to Create Edge*. Retrieved 2019 from: https://www.ct.gov/deep/cwp/view.asp?a=2723&q=325998&deepNav_GID=1655.

Council on Environmental Quality (CEQ). 1997. *Environmental Justice Guidance Under the National Environmental Policy Act (NEPA)*. Retrieved from: https://energy.gov/nepa/-downloads/environmental-justice-guidance-under-nepa-ceq-1997.

Council on Environmental Quality (CEQ). 1981. Forty Most Asked Questions Concerning CEQ's National Environmental Policy Act Regulations. Washington, DC. Retrieved from http://www.ceq.hss.doe.gov/nepa/regs/40/30-40.HTM.

Council on Environmental Quality (CEQ). 2010. Draft Guidance Consideration of the Effects of Climate Change and Greenhouse Gas Emissions, 75 Federal Register 8046 (February 23, 2010) available at http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draftguidance.pdf.

County of Henry, Virginia (County of Henry). 2019. Budget FY 2019-2020, April 2019.

Cowardin, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. U.S. Department of the Interior, Fish and Wildlife Service, Washington, D.C.

Dan River Basin Association (DRBA). 2016. Implementation Plan - Dan River Watershed Quality Improvement. Retrieved March 2019 from https://www.danriver.org.

Federal Highway Administration (FHWA). 1987. *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*. FHWA Technical Advisory T6640.8A. Retrieved from: https://www.environment.fhwa.dot.gov/projdev/impTA6640.asp.

Federal Highway Administration (FHWA). 1992. *Revised Guidance on Cooperating Agencies.* Office of Environment and Planning. Retrieved from: https://flh.fhwa.dot.gov/resources/design/pddm/extras/CooperatingAgencies199203.pdf.

Federal Highway Administration (FHWA). 2016. *Updated Interim Guidance on Mobile Source Air Toxic Analysis in NEPA Documents*. Retrieved from https://www.fhwa.dot.gov/Environment/air_quality/air_toxics/policy_and_guidance/msat/2016msat.pdf.

Federal Highway Administration (FHWA). 2019a. Freight Analysis Framework Version 4 (FAF4). Center for Transportation Analysis. Retrieved September 2019 at https://faf.ornl.gov/fafweb/Extraction1.aspx

Federal Highway Administration (FHWA). 2019b. Questions and Answers Regarding the Consideration of Indirect and Cumulative Impacts in the NEPA Process. US Department of Transportation. Retrieved March 2019 at https://www.environment.fhwa.dot.gov/nepa/QAimpact.aspx

Heffernan, K. E. Engle and C. Richardson. 2014. Virginia Invasive Plant Species List. Virginia Department of Virginia Department of Conservation and Recreation, Division of Natural Heritage. Natural Heritage Technical Document 14-11. Retrieved from https://www.dcr.virginia.gov/natural-heritage/document/nh-invasive-plant-list-2014.pdf

Henry County, Virginia. 2018. News Article – Over 200 New Jobs Coming to Commonwealth Crossing. July 30, 2018. Retrieved from: http://www.henrycountyva.gov/news/details/id/164/over-200-new-jobs-coming-to-commonwealth

Henry County Planning Commission (HCPC). 2011. *County of Henry Comprehensive Plan 1995-2010*.

ICF International, Zamurs and Associates LLC, and Volpe Transportation Systems Center. 2015. Programmatic Agreements for Project-Level Air Quality Analyses. NCHRP 25-25 (78). Retrieved from: http://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=3311

Internal Revenue Service (IRS). 2019. *Opportunity Zones Frequently Asked Questions.* Retrieved in June 2019 from: https://www.irs.gov/newsroom/opportunity-zones-frequently-asked-questions

International Panel on Climate Change (IPCC). 2014. Climate Change 2014: Synthesis Report Summary for Policymakers. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.

Jenkins, R. E. and N.M. Burkhead. 1994. Freshwater fishes of Virginia. Bethesda, Maryland.

Martinsville-Henry County Economic Development Corporation (EDC). 2018. Commonwealth Crossing Business Centre, Property Brochure. Retrieved from: https://www.yesmartinsville.com/properties/details/id/21/commonwealth-crossing

Martinsville / Henry County Economic Development Corporation (EDC). 2019. *Commonwealth Crossing Business Centre*. Retrieved from: https://commonwealthcrossing.com

National Association for Stock Car Auto Racing (NASCAR). 2019. *Pole Position: Martinsville*.

NatureServe Explorer. 2019a. NatureServe Explorer: An Online Encyclopedia of Life. Version 7.1. NatureServe, Arlington, Virginia. Available explorer.natureserve.org

NatureServe Explorer. 2019b. *Myotis septentrionalis,* Northern Long-Eared Bat. Retrieved from: http://explorer.natureserve.org/servlet/NatureServe?searchName=Myotis+septentrionalis+.

NatureServe Explorer. 2019c. *Lanius ludovicianus*, Loggerhead Shrike. Retrieved from http://explorer.natureserve.org/servlet/NatureServe?searchName=Lanius+ludovicianus.

NatureServe Explorer. 2019d. *Echinacea laevigata,* Smooth Purple Coneflower. Retrieved from http://explorer.natureserve.org/servlet/NatureServe?searchSpeciesUid=ELEMENT_GLOBAL.2.147692.

Nixon, H. and J.D. Saphores. 2003. The Impacts of Motor Vehicle Operation on Water Quality: A Preliminary Assessment.

North Carolina Department of Transportation (NCDOT). 2001. Guidance for Assessing Indirect and Cumulative Impacts of Transportation Projects in North Carolina, Vol. II: Practitioners Handbook NCDOT/ Retrieved from https://connect.ncdot.gov/resources/Environmental/Compliance%20Guides%20and%20Procedures/Volume%2002%20Assessment%20Guidance%20Practitioners%20Handbook.pdf

Office of Intermodal Planning and Investment (OIPI). 2013. VTrans2035: An Update to Virginia's Statewide Multimodal Long-Range Transportation Policy Plan. Revised August 2013.

Office of Intermodal Planning and Investment (OIPI). 2015. VTrans2040: Multimodal Transportation Plan Corridors of Statewide Significance Needs Assessment. Retrieved from: http://www.vtrans.org/resources/VMTP2025-Needs-Assessment/CoSS-Profiles/VTRANS2040_CoSS_F_NCtoWV_FINAL%2010232015.pdf

Piedmont Triad International Airport (PTI). 2018a. Cargo Services. Retrieved November 2018from: https://flyfrompti.com/cargo/.

Piedmont Triad International Airport (PTI). 2018b. Facts About the FedEx Expansion at Piedmont Triad International Airport. Retrieved November 2018 from: https://flyfrompti.com/facts-about-the-fedex-expansion-at-piedmont-triad-international-airport/.

Piedmont Triad Regional Council (PTRC). 2012. Dan River Basin Watershed Prioritization Report. Retrieved March 2019 from https://www.ptrc.org/

Rockingham County, NC. 2006. A Land Use Plan for Managing Growth: Rockingham County, North Carolina. Retrieved May 2019 from https://www.co.rockingham.nc.us/pview.aspx?id=14918

Rosgen, D.L. 1997. A Geomorphological Approate to Restoration of Incised Rivers. Retrieved January 2020 from ttps://wildlandhydrology.com/resources/docs/River%20Restoration%20-and%20Natural%20Channel%20Design/Rosgen_1997_Updated_Figures.pdf

Terwilliger, K., and J.R. Tate. 1995. A Guide to Endangered and Threatened Species in Virginia. Blacksburg: McDonald Publishing Company.

Transportation Research Board (TRB). 2002. NCHRP Report 466- Desk Reference for Estimating the Indirect Effects of Proposed Transportation Projects. Washington, DC: National Cooperative Highway Research Program. Retrieved from http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_rpt_466.pdf.

Transportation Research Board (TRB). 2005. Land Use Forecasting for Indirect Impacts Analysis. National Cooperative Highway Research Program Project 25-25 Task 22. Retrieved from http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25(22)_FR.pdf.

Transportation Research Board (TRB). 2006. Secondary/Indirect and Cumulative Effects Analysis. National Cooperative Highway Research Program Project 25-25 Task 11. Retrieved from http://onlinepubs.trb.org/onlinepubs/archive/NotesDocs/25-25(11)_FR.pdf.

U.S. Army Corps of Engineers (USACE) 1987. *Corps of Engineers Wetlands Delineation Manual*. Environmental Laboratory.

U.S. Army Corps of Engineers (USACE). 1999. *The Highway Methodology Workbook.*

U.S. Army Corps of Engineers (USACE). 2012. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0).*

U.S. Department of Agriculture (USDA). 2003. Supplemental Watershed Plan-Environmental Assessment for The Marrowbone Creek Watershed.

U.S. Department of Agriculture (USDA). 2019. Web Soil Survey. Retrieved from Natural Resources Conservation Service, United States Department of Agriculture: https://websoilsurvey.sc.egov.usda.gov/.

U.S. Department of Health and Human Services (HHS). 2019. 2019 HHS Poverty Guidelines. Retrived from U.S. HHS Office of the Assistant Secretary for Planning and Evaluation: https://aspe.hhs.gov/poverty-guidelines.

U.S. Fish and Wildlife Service (USFWS), 2011, Raleigh Ecological Services Field Office Species Profile. Retrieved from: fws.gov/Raleigh/species/es_james_spinymussel.html

U.S. Fish and Wildlife Service (USFWS), 2016a, Southeast Region Species Profile. Available fws.gov/southeast/wildlife/mussels/atlantic-pigtoe/

U.S. Fish and Wildlife Service (USFWS). 2016b. Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions. Midwest Regional Office. Bloomington, Minnesota. Accessed at https://www.fws.gov/midwest/endangered/mammals/nleb/pdf/BOnlebFinal4d.pdf.

U.S. Fish and Wildlife Service (USFWS). 2019. Northern Long-eared Bat. Listing the Northern Long-eared Bat as Threatened Questions and Answers. Retrieved from https://www.fws.gov/midwest/endangered/mammals/nleb/FAQsFinalListNLEB.html.

U.S. Fish & Wildlife Service (USFWS). 2019. Endangered Species Consultations & Frequently Asked Questions. Retrieved December 2019 from http://www.fws.gov/endangered/what-we-do/faq.html.

U.S. Energy Information Administration (EIA). 2013. *State Energy Data System (SEDS): 1960-2012 (Complete).* Washington, DC: US Department of Energy. Retrieved: http://205.254.135.7/state/?sid=VA.

U.S. Energy Information Administration (EIA). 2014. Virginia: Profile Analysis. Washington, DC: US Department of Energy. Retrieved from: https://www.eia.gov/outlooks/aeo/pdf/0383(2014).pdf

U.S. Energy Information Administration (EIA). 2015. *Virginia: Profile Analysis.* Washington, DC: US Department of Energy. Retrieved from: http://205.254.135.7/state/analysis.cfm?sid=VA.

U.S. Environmental Protection Agency (EPA). 1999. Consideration of Cumulative Impacts in EPA Review of NEPA Documents. US Environmental Protection Agency, Office of Federal Activities. Retrieved from http://www.epa.gov/compliance/resources/policies/nepa/cumulative.pdf

U.S. Environmental Protection Agency (EPA). 2015a. *National Sole Source Aquifer GIS Layer.* Retrieved January 2016: http://catalog.data.gov/dataset/national-sole-source-aquifer-gis-layer. Last updated 11/20/15.

U.S. Environmental Protection Agency (EPA). 2015b. *Overview of the Drinking Water Sole Source Aquifer Program.* Retrieved January 2016: http://www.epa.gov/dwssa/overview-drinking-water-sole-source-aquifer-program#What_Is. Last updated 10/22/15.

U.S. Environmental Protection Agency (EPA). 2016. *Background on Drinking Water Standards in the Safe Drinking Water Act (SDWA).* Retrieved January 2016: http://www.epa.gov/dwstandardsregulations/background-drinking-water-standards-safe-drinking-water-act-sdwa.

U.S. Environmental Protection Agency (EPA). 2019. *EPA EJSCREEN- EPA's Environmental Justice Screening and Mapping Tool (Version 2018.)* Retrieved from: https://ejscreen.epa.gov/mapper/.

U.S. Environmental Protection Agency (EPA). 2019a. Green Book. Retrieved June 2019 from: https://www3.epa.gov/airquality/greenbook/anayo_va.html

Virginia Department of Conservation and Recreation (VDCR). 2019a. Virginia Hydrologic Unit Explorer. Retrieved from http://consapps.dcr.virginia.gov/htdocs/maps/HUExplorer.htm

Virginia Department of Conservation and Recreation (VDCR). 2019b. Virginia Invasive Species List. Retrieved from http://www.dcr.virginia.gov/natural_heritage/invspinfo.shtml.

Virginia Department of Conservation and Recreation (VDCR). 2019c. Virginia Natural Heritage Data Explorer. Retrieved from http://www.vanhde.org/content/map.

Virginia Department of Conservation and Recreation (VDCR). 2019d. Predicted Suitable Habitat Summary (PSHS). Retrieved from https://www.dcr.virginia.gov/natural-heritage/sdm-new.

Virginia Department of Environmental Quality (VDEQ). 2005. Wellhead Protection Plan – Commonwealth of Virginia.

Virginia Department of Environmental Quality (VDEQ). 2018. Draft 2018 305(b)/303(d) Water Quality Assessment Integrated Report.

Virginia Department of Environmental Quality (VDEQ). 2019a. What's in my Backyard Online Mapper. Retrieved from https://apps.deq.virginia.gov/mapper_ext/default.aspx?service=public/wimby

Virginia Department of Environmental Quality (VDEQ). 2019b. Erosion and Sediment Control Handbook. Retrieved from https://www.deq.virginia.gov/Programs/Water/StormwaterManagement/Publications/ESCHandbook.aspx.

Virginia Department of Game & Inland Fisheries (VDGIF). 2019a. Smith River. Retrieved from: https://www.dgif.virginia.gov/waterbody/smith-river/. March 2019.

Virginia Department of Game and Inland Fisheries (VDGIF). 2019b. NLEB Winter Habitat and Roost Trees. Retrieved from Virginia Department of Game and Inland Fisheries: https://dgif-virginia.maps.arcgis.com/apps/webappviewer/index.html?id=32ea4ee4935942c092e41ddcd19e5ec5.

Virginia Department of Game and Inland Fisheries (VAFWIS), 2019, Fish and Wildlife Information Service BOVA Booklet "Floater, green". Available vafwis.dgif.virginia.gov/fwis/booklet.html

Virginia Department of Transportation (VDOT) 1926. Location and Design Division (Archived Plans). Plan and Profile of Proposed State Highway Henry County Ridgeway to N.C. Line. July 1926.

Virginia Department of Transportation (VDOT) 1953. Location and Design Division (Archived Plans). Plan and Profile of Proposed State Highway Henry County From 0.103 Mi. S. N.C.L. of Ridgeway to 0.135 Mi. N. Int. Rte. 58 S. of Martinsville. December 1951. Revised February 1953.

Virginia Department of Transportation (VDOT) 1956. Location and Design Division (Archived Plans). Plan and Profile of Proposed State Highway Henry County From N.C. State Line to 2.917 Mi. N. N.C. State Line. January 1956.

Virginia Department of Transportation (VDOT) 1962. Location and Design Division (Archived Plans). Plan and Profile of Proposed State Highway Henry County From 2.917 Mi. N. North Carolina State Line to 4.508 Mi. N. North Carolina State Line. July 1960. Revised September 1962.

Virginia Department of Transportation (VDOT) 1965. Location and Design Division (Archived Plans). Plan and Profile of Proposed State Highway Henry County From N.C.L. of Ridgeway to 1.23 Mi. S. of S.C.L. Martinsville. September 1964. Revised July 1965.

Virginia Department of Transportation (VDOT) 1969. Location and Design Division (Archived Plans). Plan and Profile of Proposed State Highway Henry County From SR57 to US 220 Martinsville. July 1969.

Virginia Department of Transportation (VDOT) 1970. Location and Design Division (Archived Plans). Plan and Profile of Proposed State Highway Henry County From 0.455 Mi. S. S.C.L. Ridgeway to N.C.L. Ridgeway. July 1969. Revised August 1970.

Virginia Department of Transportation (VDOT) 2004. Transportation and Mobility Planning Division. VTrans2025: Virginia's Statewide Multimodal Long-Range Transportation Plan, Phase 3 and Final Report to the General Assembly. November 17, 2004.

Virginia Department of Transportation (VDOT). 2014. VDOT Transportation and Mobility Division, Functional Classification Comprehensive Guide. June 2014.

Virginia Department of Transportation (VDOT). 2016. Road and Bridge Specifications.

Virginia Department of Transportation (VDOT). 2018a. Daily Traffic Volume Estimates Including Vehicle Classification Estimates, Jurisdiction Report 44, Henry County, Martinsville, Ridgeway. Retrieved from http://www.virginiadot.org/info/resources/Traffic_2017/AADT_044_Henry_2017.pdf

Virginia Department of Transportation (VDOT). 2018b. Road Design Manual. Revised July 2018.

Virginia Department of Transportation (VDOT). 2018c. Office of Intermodal Planning and Investment. VTrans Multimodal Transportation Plan Freight Element (Freight 2040).

Virginia Department of Transportation (VDOT). 2018d. *Project–Level Air Quality Analysis Resource Document, April 2016, updated December 2018*.

Virginia Department of Transportation (VDOT). 2019a. Six-Year Improvement Program, Fiscal Year 2020-2025 Final.

Virginia Department of Transportation (VDOT). 2019b. Statewide Transportation Improvement Program. FY 18-21. Retrieved from : http://www.virginiadot.org/about/resources/STIP_External.pdf

Virginia Department of Transportation (VDOT). 2020a. *Martinsville Southern Connector Study Traffic and Transportation Technical Report*.

Virginia Department of Transportation (VDOT). 2020b. *Martinsville Southern Connector Study Alternatives Analysis Technical Report*.

Virginia Department of Transportation (VDOT). 2020c. *Martinsville Southern Connector Study Socioeconomic and Land Use Technical Report*.

Virginia Department of Transportation (VDOT). 2020d. *Martinsville Southern Connector Study Natural Resources Technical Report*.

Virginia Department of Transportation (VDOT). 2020e. *Martinsville Southern Connector Study Hazardous Materials Technical Report*.

Virginia Department of Transportation (VDOT). 2020f. *Martinsville Southern Connector Study Air Quality Technical Report*.

Virginia Department of Transportation (VDOT). 2020g. *Martinsville Southern Connector Study Noise Analysis Technical Report*.

Virginia Department of Transportation (VDOT). 2020h. *Martinsville Southern Connector Study Phase 1A Archaeological Assessment*.

Virginia Department of Transportation (VDOT). 2020i. *Martinsville Southern Connector Study Architectural History Survey*.

Virginia Department of Transportation (VDOT). 2020j. *Martinsville Southern Connector Study Indirect and Cumulative Effects Technical Report*.

Virginia Department of Transportation (VDOT). 2020k. *Martinsville Southern Connector Study Section 4(f) Analysis*.

Virginia Division of Mineral Resources (1996). Geology and Mineral Resources of Henry County and the City of Martinsville, Virginia.

Virginia Employment Commission (VEC). (2019). *Virginia Community Profile- Henry County.* Retrieved from: VirginiaLMI.com.

Virginia Highways Project. (2018a). US Route 220. Retrieved from: http://www.vahighways.com/route-log/us220.htm

Virginia Highways Project. (2018b). US Route 311. Retrieved from: http://www.vahighways.com/route-log/us311.htm

West Piedmont Planning District Commission (WPPDC). 2011. 2035 Rural Long Range Transportation Plan.

West Piedmont Planning District Commission (WPPDC). 2013. Corridors of Statewide Significance, North Carolina to West Virginia Corridor – U.S. 220.

West Piedmont Planning District Commission (WPPDC). 2017. PART Expansion Bus Stops. Retrieved from: http://www.henrycountyva.gov/content/uploads/planning/part_expansion_2017.pdf

White House. 2014. *US-China Joint Announcement on Climate Change*," White House, Office of the Press Secretary, November 11, 2014, on the White House website, https://www.whitehouse.gov/the-press-office/2014/11/11/us-china-jointannouncement-climate-change, accessed June 5, 2015.

Wilcove, D.S. 1987. From fragmentation to extinction. Natural Areas Journal 7 (1):23-9.

William and Mary 2019. Minerals, Rocks and Fossils. Retrieved from The Geology of Virginia: http://geology.blogs.wm.edu/piedmont/

Woods, A. J., J.M. Omernik, and D.D Brown. 1999. Level III and IV Ecoregions of Delaware, Maryland, Pennsylvania, Virginia, and West Virginia. U.S. EPA National Health and Environmental Effects.

APPENDIX A

Draft Section 4(f) Evaluation

DRAFT SECTION 4(f) EVALUATION

Martinsville Southern Connector Study

Route 220 Environmental Impact Statement

Federal Project Number STP-044-2(059)
State Project Number: 0220-044-052, P101; UPC: 110916

March 2020

TABLE OF CONTENTS

List of Figures

List of Tables

List of Acronyms

ACHP	Advisory Council on Historic Preservation
APE	Area of Potential Effects
DOI	Department of the Interior
EIS	Environmental Impact Statement
EO	Executive Order
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration
FY	Fiscal Year
LOD	Illustrative Planning Level Limits of Disturbance
NEPA	National Environmental Policy Act
NRHP	National Register of Historic Places
OFD	One Federal Decision
SHPO	State Historic Preservation Officer
USACE	United States Army Corps of Engineers
V-CRIS	Virginia Cultural Resource Information System
VDHR	Virginia Department of Historic Resources
VDOT	Virginia Department of Transportation

1. INTRODUCTION

The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the Federal Lead Agency and in cooperation with the U.S. Army Corps of Engineers (USACE) and the U.S. Environmental Protection Agency (EPA), have prepared a Draft Environmental Impact Statement (EIS) for the Martinsville Southern Connector Study - Route 220 EIS (Martinsville Southern Connector Study). This study evaluates potential transportation improvements along the U.S. Route 220 (Route 220) corridor between the North Carolina state line and U.S. Route 58 (Route 58) in Henry County near the City of Martinsville (Martinsville), Virginia.

The study area for the Martinsville Southern Connector Study is located south of Martinsville in Henry County, Virginia. (see **Figure 1-1**). Positioned on the southern border of Virginia, the study area is located approximately 60 miles southeast of the City of Roanoke via Route 220, 30 miles west of the City of Danville via Route 58, and 40 miles north of the City of Greensboro in North Carolina via Interstate 73 and Route 220.

The study area encompasses approximately seven miles of the Route 220 corridor, between the interchange of Route 220 with William F. Stone Highway and the North Carolina state line. Within the study area, existing Route 220 consists of a four-lane roadway, with two travel lanes in each direction. The William F. Stone Highway is signed as Route 58 east of the interchange with Route 220; west of the interchange, Route 220 is collocated with Route 58, as both facilities bypass Martinsville. For the purposes of consistency in this study, portions of the William F. Stone Highway east and west of the Route 220 interchange are herein referred to as Route 58. The study area also includes the interchange of Route 58 at Route 641 (Joseph Martin Highway), approximately 1.25 miles west of Route 220. Additionally, the study area encompasses the Town of Ridgeway (Ridgeway), where Route 220 connects with Route 87 (Morehead Avenue), approximately three miles south of Route 58. The study area boundary for the Martinsville Southern Connector Study has been developed to assist with data collection efforts and the evaluation of the build alternatives retained for evaluation.

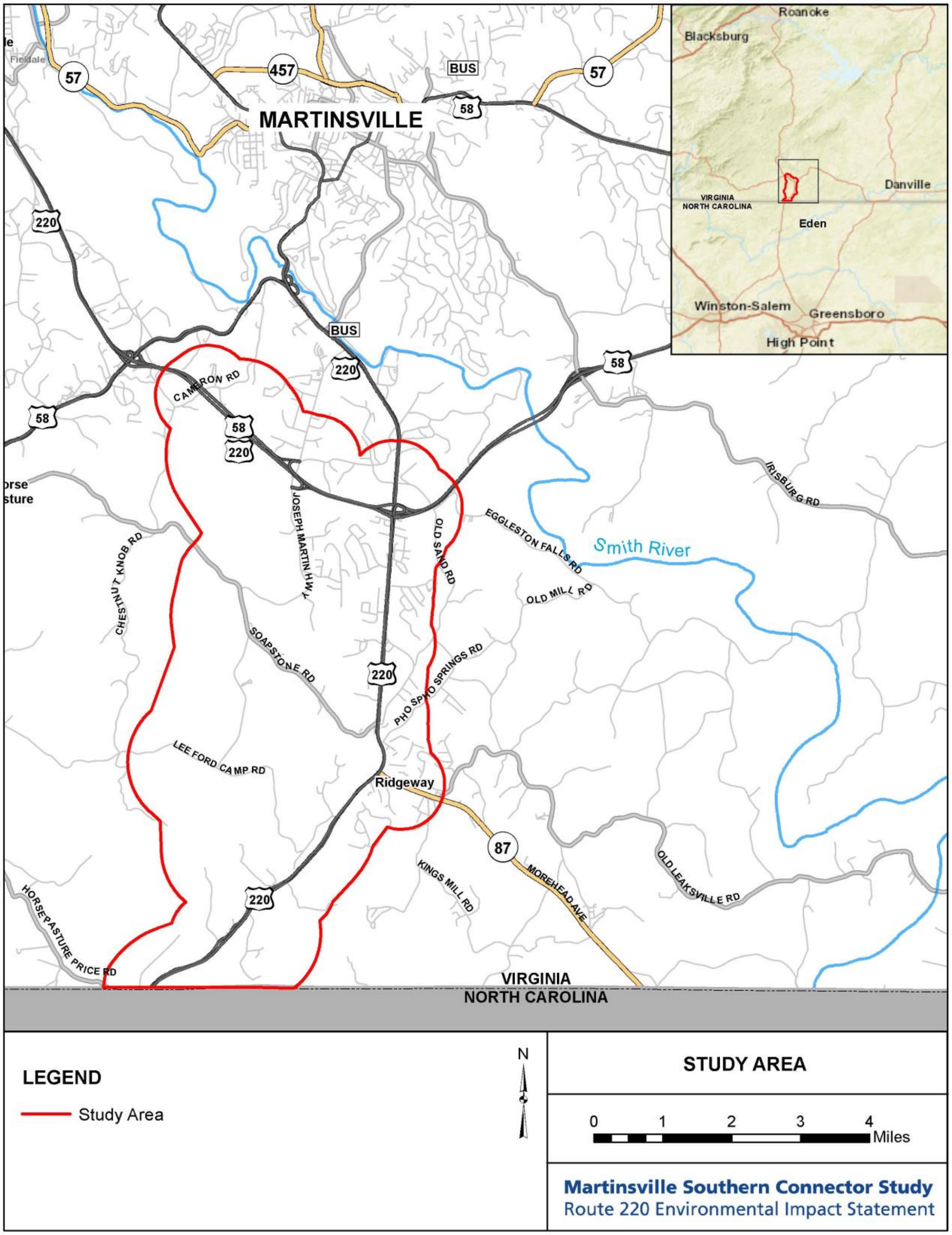
The Draft EIS and supporting technical documentation have been prepared pursuant to the National Environmental Policy Act of 1969 (NEPA), codified in 42 USC §4321-4347, as amended, and in accordance with FHWA regulations, found in 23 CFR §771. As part of this Draft EIS, the environmental review process has been carried out following the conditions and understanding of the *NEPA and Clean Water Act (Section 404) Merged Process for Highway Projects in Virginia* (merged process)[1]. The Martinsville Southern Connector Study is also being conducted consistent with the provisions of *Executive Order (EO) 13807: Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure Projects* (82 FR 40463).[2]

---

[1] Established under a memorandum of agreement between VDOT, FHWA, USACE, EPA, and the U.S. Fish and Wildlife Service (UFWS), the merged process establishes a procedure for coordinated environmental review and development of documentation in Virginia that complies with the requirements of NEPA and provides sufficient information to support Federal regulatory decision-making, including FHWA approval or permits issued by other Federal agencies.

[2] The Martinsville Southern Connector Study is following the One Federal Decision (OFD) process, subsequent to receiving OFD designation by FHWA. OFD requires that projects have a single permitting timetable for synchronized environmental reviews and authorizations: www.permits.performance.gov/-permitting-projects/us-route-58220-bypass-north-carolina-state-line-limited-access-study.

Figure 1-1: Study Area



In support of the Draft EIS analysis that is being prepared, this Draft Section 4(f) Evaluation has been developed to:

- Identify Section 4(f) properties within the study area;
- Describe, identify, and assess potential uses of Section 4(f) properties within the Inventory and Design Corridor for each alternative;
- Identify the potential for a *de minimis* impact to apply; and
- Develop avoidance alternatives to the use of Section 4(f) properties where the impact is not *de minimis*.

1.1 PURPOSE AND NEED

Working with the FHWA and the Cooperating and Participating Agencies, the Purpose and Need for the study was concurred upon on November 2018. The purpose of the Martinsville Southern Connector Study is to enhance mobility for both local and regional traffic traveling along Route 220 between the North Carolina state line to Route 58 near the City of Martinsville, Virginia.

The Martinsville Southern Connector Study addresses the following needs:

- **Accommodate Regional Traffic** – current inconsistencies in access, travel speeds, and corridor composition along Route 220 inhibits mobility and creates unsafe conditions considering the high volume of truck and personal vehicle traffic traveling through the corridor to origins and destinations north and south of the study area;
- **Accommodate Local Traffic** – numerous, uncontrolled access configurations along Route 220, combined with high through traffic movement, create traffic delays and contribute to high crash rates for travelers within the corridor accessing residences, commercial buildings, and schools; and
- **Address Geometric Deficiencies and Inconsistencies** – current geometric conditions along Route 220, such as lane widths, horizontal curves, and stopping sight distances, are below current design standards and vary along the length of the corridor, resulting in safety concerns for all users.

1.2 ALTERNATIVES RETAINED

VDOT, in coordination with FHWA and the Cooperating and Participating Agencies considered a range of alignment options to potentially evaluate in the Martinsville Southern Connector Study, as possible solutions to address the established Purpose and Need. A number of these alignment options were not carried forward for consideration based on their inability to meet the Purpose and Need established for the Route 220 corridor. The alignment options carried forward were developed into alternatives retained for detailed evaluation in this Draft EIS. As part of the public involvement process during the development of the Draft EIS, additional alternatives were suggested for evaluation. These options were similar to the initial alignment options considered and were not retained based on their inability to effectively address the identified Purpose and Need for the study.

The alternatives carried forward for evaluation and retained for detailed study in the Draft EIS are listed below and are illustrated on **Figure 1-2**:

- Alternative A – New access-controlled alignment west of existing Route 220 with a new interchange with Route 58 to the west of Route 641 (Joseph Martin Highway) and reconstruction of the existing Route 220 alignment for approximately one mile from the North Carolina state line;
- Alternative B – New access-controlled alignment west of existing Route 220 and west of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at

Route 58 and reconstruction of the existing Route 220 alignment for approximately one mile from the North Carolina state line; and

- Alternative C – New access-controlled alignment west of existing Route 220 and east of Magna Vista High School with reconstruction of the Joseph Martin Highway interchange at Route 58 and reconstruction of the existing Route 220 alignment for approximately one mile from the North Carolina state line.

These alternatives are described in the sections that follow. Additional information is included in the Draft EIS and supporting ***Alternatives Analysis Technical Report*** (VDOT 2020b), including the process used to identify and screen alignment options, alternatives considered and eliminated from further consideration, and alternatives carried forward for detailed study.

Based on the detailed study of the alternatives retained for evaluation, Alternative C has been identified in this Draft EIS as the Preferred Alternative.

1.2.1 No-Build Alternative

In accordance with the regulations for implementing NEPA (40 CFR §1502.14(d)), the No-Build Alternative has been included for evaluation as a basis for the comparison of future conditions and impacts. The No-Build Alternative would retain the Route 220 roadway and associated intersections and interchanges in their present configuration, allowing for routine maintenance and safety upgrades.

This alternative assumes no major improvements within the study area, except for previously committed projects that are currently programmed and funded in VDOT's *Six Year Improvement Plan (SYIP) for Fiscal Year (FY) 2020-2025* (VDOT, 2019) and Henry County's *Budget for FY 2019-2020* (Henry County, 2019). As these other projects are independent of the evaluated alternatives, they are not evaluated as part of the Draft EIS and supporting documentation.

1.2.2 Alternative A

Alternative A would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative A, access would be controlled and provided at three new interchanges. It is assumed that interchanges would be provided at both ends of the facility and one would be located along the corridor. For the purposes of the analyses in this Draft EIS, it is assumed this third interchange would occur at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative A would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad. The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest crossing Patterson Branch. The alignment would then shift to the north, following a small ridge between Patterson Branch and a tributary to Marrowbone Creek, before crossing Marrowbone Creek east of Marrowbone Dam. The alignment would continue north and to the west of a large farm/open field, crossing tributaries of Marrowbone Creek. The alignment would shift eastward and cross over Lee Ford Camp Road, Stillhouse Run, and the floodplain. After crossing Stillhouse Run, the alignment would shift northward and continue for approximately one mile. The alignment would then continue north reaching Soapstone Road, where a new interchange would be located, west of the intersection with Joseph Martin Highway. The alignment would then turn to the northeast to cross three minor tributaries to Marrowbone Creek. The alignment continues in a northerly direction with a new interchange at Route 58, west of the interchange at Joseph Martin Highway.

1.2.3 Alternative B

Alternative B would consist of a new roadway alignment that is primarily to the west of existing Route 220. Under Alternative B, access would be controlled and provided at two new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. For the purposes of the analyses in this Draft EIS it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative B would reconstruct Route 220 for approximately one mile, where it would shift eastward before turning to the north to cross over the Norfolk Southern railroad. The wide horizontal curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, as well as minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would parallel White House Road along its south side and then shift to the northwest prior to crossing Patterson Branch. The alignment would then gradually shift from the northwest to the northeast and cross three tributaries to Marrowbone Creek. The alignment would continue in a northeasterly direction over Lee Ford Camp Road, where it would pass to the east of the Marrowbone Plantation, shifting northwest to cross Marrowbone Creek. After crossing Marrowbone Creek, Alternative B would continue to the northwest, crossing Magna Vista School Road south of Magna Vista High School, then paralleling Magna Vista School Road west of the high school up to an new interchange with Soapstone Road. The new interchange at Soapstone Road would require the relocation of a portion of Magna Vista School Road. From the Soapstone Road interchange, the alignment would continue to the northeast and cross two minor tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at its interchange with Route 58, requiring modifications to the existing interchange configuration to provide a more direct connection between Route 58 and the new roadway. The reconstructed portion of Route 220 at the southern end, along with the new alignment, would be an access-controlled facility

1.2.4 Alternative C (Preferred Alternative)

Alternative C would consist of a new roadway alignment that is primarily to the west of existing Route 220. Alternative C was developed as a modification of the initially considered Alignment Option 4C based on agency comments, with the primary changes occurring north of Soapstone Road. Alignment Option 4C originally included an interchange between Joseph Martin Highway and Route 220, however, adequate spacing could not be provided to accommodate all movements. Therefore, the alignment was shifted to tie in at the location of the existing Joseph Martin Highway interchange. Under Alternative C, access would be controlled and provided at two new interchanges and a modified interchange at Route 220/Route 58 and Joseph Martin Highway. For the purposes of the analyses in this Draft EIS it is assumed that new interchanges would be provided at the southern end of the facility and at Soapstone Road. If this alternative were to advance to a phase of more detailed design, the final interchange locations and configuration would be refined. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

Beginning at the North Carolina state line, Alternative C would reconstruct Route 220 for approximately one mile, where it would shift eastward on a new alignment before turning to the north to cross over the Norfolk Southern railroad.

The wide curve in this location would allow for an adequate turning radius to meet design standards for the arterial facility with a 60 mph design speed, and minimize potential impacts to residents in the vicinity of J.B. Dalton Road. A new interchange to access a realigned existing Route 220 would be constructed near Reservoir Road and J.B. Dalton Road. After crossing the railroad, the new alignment would continue northward for approximately 1.5 miles, crossing White House Road and a tributary to Marrowbone Creek. The alignment would then shift to the northeast to cross Lee Ford Camp Road. The alternative would then shift northward and continue east of Magna Vista High School and Marrowbone Creek and parallel the Pace airport to the east. After passing Pace airport, the alignment would shift to the northeast and cross Soapstone Road to the east of Marrowbone Creek. A new interchange with Alternative C would be constructed at Soapstone Road. North of Soapstone Road, the alignment would shift west and cross Joseph Martin Highway. The alignment would continue to the northwest and cross two tributaries before shifting to the north. The alignment would then shift to the northeast to cross Little Marrowbone Creek and tie in with Joseph Martin Highway at the existing interchange location with Route 58. This would require modifications to the existing interchange to provide a more direct connection between Route 58 and the new roadway.

1.3 ALTERNATIVES NOT RETAINED

As part of the alternatives development process for the Draft EIS, the following alternatives were carried forward for consideration, but have not been retained for detailed evaluation in the Draft EIS, based on their based on context and intensity of the anticipated property impacts[3]. However, these alternatives were evaluated to a sufficient level of detail to eliminate them from further consideration. While this Technical Report does not include the analysis of Alternatives D and E, other technical reports, such as the ***Natural Environmental Technical Report*** (VDOT 2020d), were prepared prior to the elimination of alternatives and thus include the following two alternatives, which are summarized in the sections that follow.

- Alternative D – previously named Alignment Option 4D - Reconstruction of Route 220 to an access-controlled roadway, with a spur on new alignment to the west, north of Ridgeway, and reconstruction of the Joseph Martin interchange at Route 220/Route 58; and
- Alternative E – previously named Alignment Option 3 - Reconstruct Route 220 as an access-controlled roadway, consolidating access to Route 220 to interchanges at select locations.

These alternatives are illustrated on **Figure 1-2**.

1.3.1 Alternative D

Alternative D would consist of reconstructing existing Route 220 as an access-controlled roadway for approximately 5.6 miles from the North Carolina state line where it would then divert to the west on a new access-controlled roadway just north of Water Plant Road. Under Alternative D, access would be controlled and provided at three new interchanges and a modified interchange at Route 58 and the Joseph Martin Highway. South of Water Plant Road, access to the new roadway would be made via frontage roads and new interchanges near Reservoir Road and at Morehead Avenue. A new structure providing access to Route 220 would be located at Lee Ford Camp Road/Church Street. At Water Plant Road a new interchange would be located where the

[3] Context analyses significance of an impact by geography (national, regional, or local) – where the impact occurs. Intensity refers to the severity of the impact, in whatever context(s) it occurs. See 40 CFR § 1508.27.

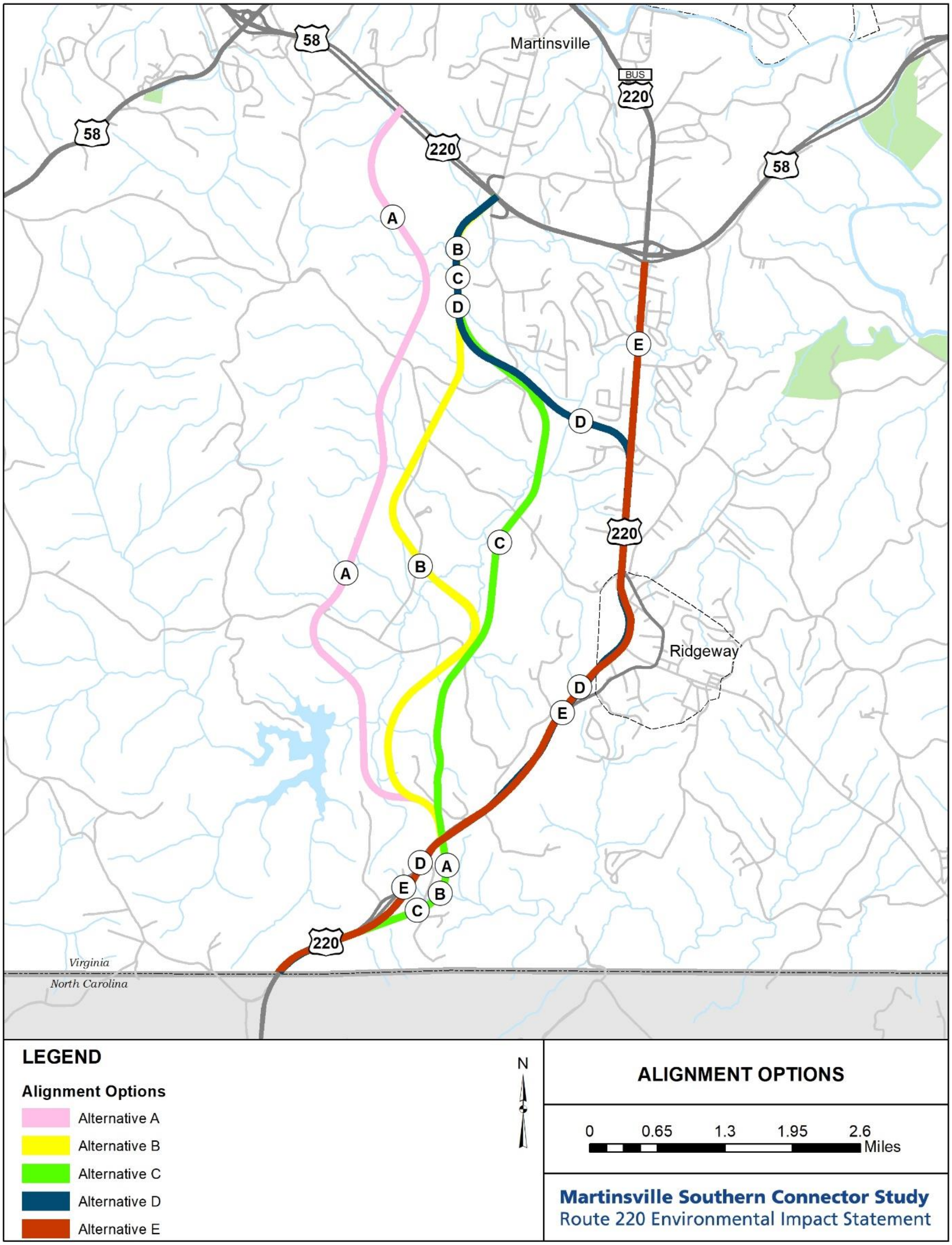
new roadway branches from Route 220 to provide direct access between the new roadway and Route 220 to the north. From this interchange, the new alignment travels northwest, crossing Marrowbone Creek and then parallels a tributary of Marrowbone Creek to beyond Joseph Martin Highway. The alignment then shifts northward and follows the same alignments as Alternatives B and C just north of the Radial warehouse site to the tie-in location with Route 58. Modifications to the interchange at Route 58 and Joseph Martin Highway would be required with this alternative. The reconstructed portion of Route 220, along with the new alignment, would incorporate access control.

1.3.2 Alternative E

Alternative E would consist of fully reconstructing existing Route 220 as an access-controlled roadway between the North Carolina state line and Route 58, removing all direct connections of existing driveways and side streets to Route 220.

Under Alternative E, access would be controlled and provided only at interchanges at various locations in the corridor. Existing residential and commercial driveways would be directed to frontage roads that parallel the roadway, ultimately connecting to Route 220 at interchanges. New interchanges to provide frontage road access to Route 220 are located at Reservoir Road and at Morehead Avenue. Structures over or under the new Route 220 roadway are included at Lee Ford Camp Road/Church Street and Soapstone Road/Main Street to provide east-west connectivity. The Route 220 interchange at Route 58 would be modified to provide direct access between the new roadway, Route 58, and Business Route 220 to the north.

Figure 1-2: Route 220 Alternative Alignment Map



2. SECTION 4(f) REGULATORY CONTEXT AND METHODOLOGY

This Draft Section 4(f) Analysis describes Section 4(f) properties identified within or proximate to the illustrative planning level limits of disturbance (LOD) of the alternatives retained for detailed evaluation and potential use of those properties. Section 4(f) of the US Department of Transportation Act of 1966 as amended stipulates that the U.S. Department of Transportation, including the FHWA, cannot approve the use of land from a publicly owned park, recreation area, wildlife or waterfowl refuge, or public or private historic site unless the following conditions apply:

- The FHWA determines that there is no feasible and prudent avoidance alternative to the use of land from the property, and the action includes all possible planning to minimize harm to the property resulting from such use (23 CFR §774.3(a)); or
- The FHWA determines that the use of the Section 4(f) properties, including any measures to minimize harm (such as avoidance, minimization, mitigation, or enhancement measures) committed to by the applicant, will have a *de minimis* impact on the property (23 CFR §774.3(b)).

Under Section 4(f), a use of a Section 4(f) property occurs (23 CFR §774.17):

1. When land is permanently incorporated into a transportation facility;
2. When there is a temporary occupancy of land that is adverse in terms of the statute's preservation purpose; or
3. When there is a constructive use.

A permanent use occurs when land from a Section 4(f) property is permanently incorporated into a transportation project. This may occur as a result of partial or full acquisition of the Section 4(f) property, permanent easements, or temporary easements that exceed regulatory limits.

For this Section 4(f) Analysis, temporary use has been accounted for in the overall determination of use for each Section 4(f) property. Temporary occupancy of Section 4(f) lands will be determined during later stages of design and would not be considered a use if all of the following conditions exist:

- The land use is of short duration (defined as less than the time needed for the construction of the project);
- There is no change in ownership of the land;
- The scope of the work must be minor;
- There are no temporary or permanent adverse changes to the activities, features, or attributes of the property;
- The land must be fully restored to a condition at least as good as prior to the project; and
- There must be documented agreement from the official(s) with jurisdiction over the property with the above conditions.

FHWA regulations at 23 CFR §774.15 state that a Section 4(f) use can occur when a transportation project does not incorporate land from a Section 4(f) resource into the project, but the project's proximity impacts are so severe that the protected activities, features, or attributes that qualify a resource for protection under Section 4(f) are substantially impaired. Substantial impairment occurs only when the protected activities, features or attributes of the resource are substantially diminished. Constructive use is only possible in the absence of permanent incorporation or temporary occupancy of the type that constitutes a use of 4(f) property by a transportation project. Stated another way, a resource that is experiencing a use as represented by permanent incorporation cannot also experience a constructive use.

A substantial impairment of a public park or historic site is one that would substantially detract from the setting of a park or historic site which derives its value in substantial part due to its setting. The noise analysis completed in the ***Noise Analysis Technical Report*** (VDOT 2020g) determined noise impacts for each Section 4(f) property proximate to the LOD of each alternative. However, none of these properties derive their value in substantial part due to their setting. Therefore, no properties have been identified where noise would create a Section 4(f) constructive use.

This Section 4(f) Analysis also provides FHWA's intent not to pursue *de minimis* impact findings since no sites are impacted by the Preferred Alternative. A *de minimis* impact means that the project will have no adverse effect on any properties.

2.1 SECTION 4(f) PROPERTIES

Coordination was undertaken with Henry County, as well as the Virginia Department of Game and Inland Fisheries, Virginia Department of Conservation and Recreation and the U.S. National Park Service to identify any publicly owned parks, recreation areas, and wildlife and waterfowl refuges within or in close proximity to the Build Alternatives. Mapping sources included the Henry County Geographic Information System Database, Federal/state/local databases maintained by VDOT, and Google Maps™. In addition, consultation was initiated with the Virginia Department of Historic Resources (VDHR) and other consulting parties pursuant to Section 106 of the National Historic Preservation Act to identify historic sites of national, state or local significance within or in close proximity to the Alternative Inventory Corridors.

Historic architectural and archaeological surveys have been conducted to identify resources that meet the criteria for the National Register of Historic Places (NRHP) eligibility and that could potentially be affected by the Build Alternatives. No previously recorded archaeological sites have been documented within the direct effects Area of Potential Effect (APE) for Alternatives A, B, and C. Additional information can be found in the ***Phase IA Archaeological Assessment*** (VDOT, 2020h). There are five architectural resources within the APE associated with the three alternatives either already listed on the NRHP or eligible for listing on the NRHP. The results of field surveys and archival research undertaken for the purposes of identifying architectural historic properties within the direct and indirect effects APEs for the three alternatives can be found in the ***Architectural History Survey*** (VDOT, 2020i). These results are preliminary and have not yet been coordinated with the State Historic Preservation Office (SHPO).

Table 2-1 and **Table 2-2** identify the Section 4(f) properties by name, official with jurisdiction, and whether or not it would incur a Section 4(f) use for all of the Build Alternatives retained for evaluation. **Figure 2-1** identifies the location of Section 4(f) properties. Six Section 4(f) properties are within or in close proximity to the LOD of the Build Alternatives.

Table 2-1: Public Parks and Recreation Areas

Property	Official with Jurisdiction	Section 4(f) Use by Alternative		
		A	B	C
Magna Vista High School	Henry County	No	No	No

Table 2-2: Historic Properties

Property	VDHR Number	Official with Jurisdiction	Section 4(f) Use by Alternative		
			A	B	C
Belleview	044-0002	VDHR	Yes	Yes	No
Marrowbone	044-0009	VDHR	No	Yes	No
Patterson Cemetery	044-5182	VDHR	No	No	No
Price Cemetery	044-5183	VDHR	No	No	No
Watkins Cemetery	044-5188	VDHR	No	No	No

2.2 PARK AND HISTORIC PROPERTIES PROTECTED BY SECTION 4(f)

For the purposes of this analysis, it was assumed that the direct APE is similar to the planning level LOD, and that a use would be assumed to occur if the Section 4(f) property was within the LOD of the alternative. One public park and recreational area and five historic architectural properties either already listed on the NRHP or eligible for listing on the NRHP are protected by Section 4(f). Of these, three historic properties require a Section 4(f) use by one or more of the alternatives. These properties are identified in **Table 2-1** and **Table 2-2**. Descriptions of these Section 4(f) properties are provided in **Section 2.2.1** and **Section 2.2.2**.

2.2.1 Public Park and Recreation Areas

2.2.1.1 Magna Vista High School

Relationship
Figure 2-1 shows the relationship of Magna Vista High School and associated recreational fields to the alternatives.

Area
Magna Vista High School and its recreational fields are situated on 133.47 acres of land along Magna Vista School Road, west of Route 220.

Ownership
Magna Vista High School and its recreational fields are owned by the Henry County School Board.

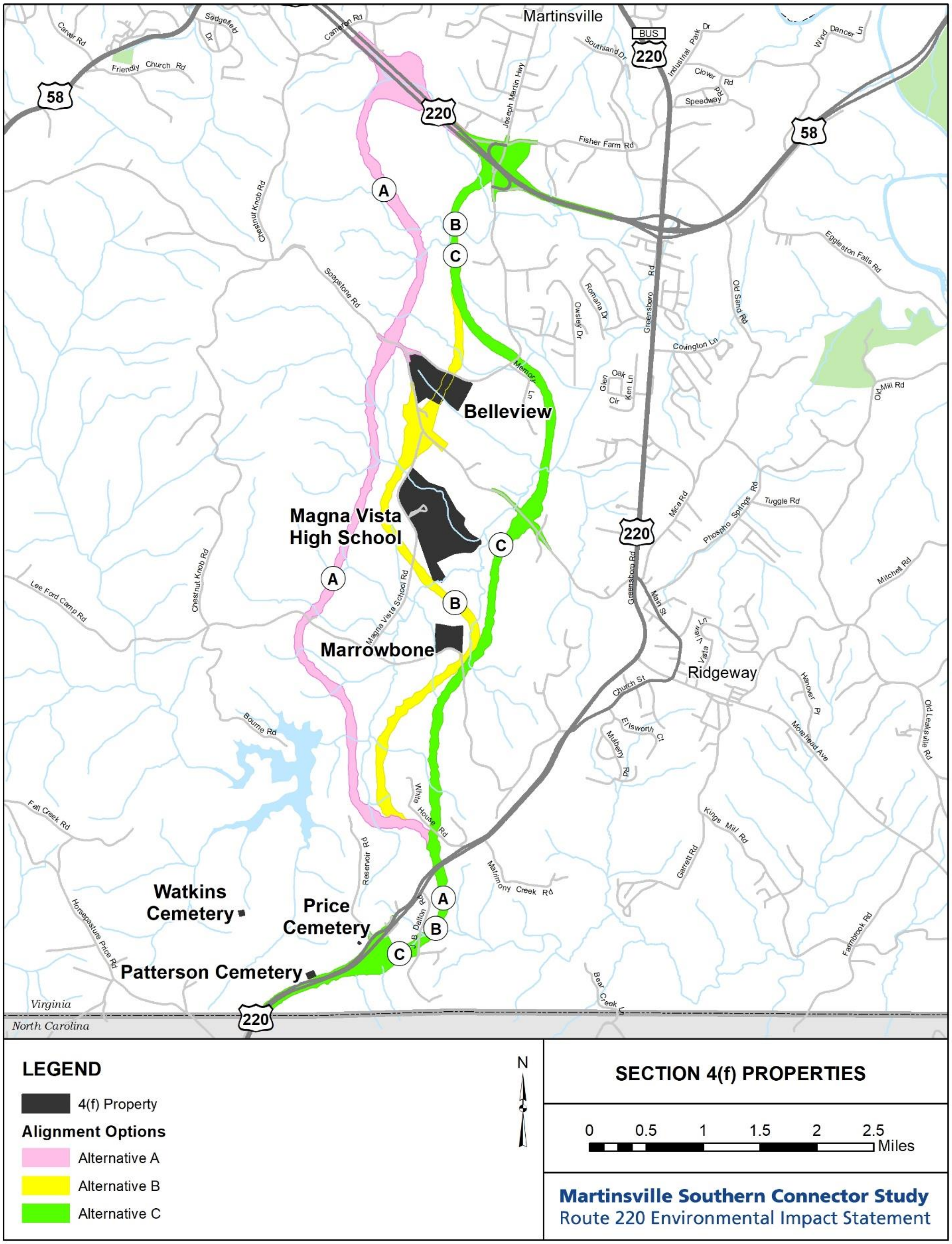
Activities
The property includes one recreation field, three baseball diamonds, an athletic track, and tennis courts. Large-scale outdoor sports such as track, baseball, and softball take place on the recreational fields. The fields are utilized by school sports teams, community recreational leagues and the public.

Access
The school has three vehicular entrances along Magna Vista Road. One of those entrances is to the parking lot that provides access to the athletic fields, track, and tennis courts located on the south side of the property. The flow of bus and pick-up/drop-off traffic is to enter on the south side and exit on the north side. The northern entrance provides access to a baseball diamond behind the school building.

Similarly Used Lands
Drewry Mason Elementary School, also in the Henry County Public School System, has similar large-scale outdoor recreational fields.

Clauses Affecting Ownership
There are no known clauses affecting ownership of the property with respect to transportation improvements.

Figure 2-1: Section 4(f) Resources – Public Parks, Recreation Areas, and Historic Properties



Unusual Characteristics
There are no unusual characteristics associated with the Magna Vista High School and recreational fields.

2.2.2 Historic Sites

2.2.2.1 Belleview (VDHR No. 044-0002/ NRHP Listed)

Relationship
Figure 2-1 shows the relationship of the Belleview property to the alternatives.

Area
Belleview is comprised of approximately 61.85 acres of land and sits at the intersection of Route 687 (Soapstone Road) and Joseph Martin Highway, approximately 1.21 miles west of Route 220 in Henry County. Belleview is within the direct and indirect APE for Alternatives A and B, but is outside the direct and indirect APE for Alternative C.

Ownership
Belleview is privately owned and operated.

Activities
Belleview is a late-eighteenth century house with Federal details. The historic property was listed on the NRHP in 1974 under Criterion C for its significance in architecture. The Virginia Cultural Resource Information System (V-CRIS) record for this property states that the dwelling burned in the early 1990s; however, during the course of the fieldwork for this study it was discovered that the dwelling has been carefully restored and therefore, still retains sufficient integrity to convey its significance.

Access
Belleview has access from three driveways to Joseph Martin Highway.

Similarly Used Lands
The Marrowbone property, also in Henry County, has similar uses.

Clauses Affecting Ownership
There are no known clauses affecting ownership of the property with respect to transportation improvements.

Unusual Characteristics
There are no unusual characteristics associated with the Belleview property.

2.2.2.2 Marrowbone (VDHR No. 044-0009/ NRHP Eligible)

Relationship
Figure 2-1 shows the relationship of the Marrowbone property to the alternatives.

Area
Marrowbone is comprised of approximately 21.78 acres of land and sits east of the intersection of Route 1060 (Magna Vista School Road) and Route 688 (Lee Ford Camp Road), approximately 1.23 miles west of Route 220 in Henry County. Marrowbone is within the direct and indirect APEs for Alternative B, but is not in the direct or indirect APEs for Alternatives A and C.

Ownership
Marrowbone is privately owned and operated.

Activities

Marrowbone is a ca. 1870 Italianate house, a very uncommon style for Henry County. The property was determined eligible for the NRHP in 1996 under Criterion C for its significance in architecture.

Access

Marrowbone has one access driveway to Lee Ford Camp Road.

Similarly Used Lands

The Belleview property, also in Henry County, has similar uses.

Clauses Affecting Ownership

There are no known clauses affecting ownership of the property with respect to transportation improvements.

Unusual Characteristics

There are no unusual characteristics associated with the Marrowbone property.

2.2.2.3 Patterson Cemetery (VDHR No. 044-5182/NRHP Eligible)

Relationship

Figure 2-1 shows the relationship of the Patterson Cemetery property to the alternatives.

Area

Patterson Cemetery is comprised of approximately 1.65 acres of land and sits north of Route 220 and the Norfolk and Southern railroad tracks in Henry County. Patterson Cemetery is within the direct and indirect APEs for Alternatives A and B. In addition, the cemetery is within the indirect APE for Alternative C.

Ownership

Patterson Cemetery is privately owned and operated.

Activities

Patterson Cemetery contains approximately 40 burials from the late-eighteenth century into the mid-twentieth century. The gravestones have varying degrees of decoration from simple unmarked stones, to more elaborate decorative markers. The Patterson Cemetery was determined eligible in 2009 under Criterion D for the resource’s potential to yield information.

Access

Patterson Cemetery has one access from a gravel road to Route 220, crossing the Norfolk Southern railroad.

Similarly Used Lands

The Price Cemetery and Watkins Cemetery properties, also in Henry County, have similar uses.

Clauses Affecting Ownership

There are no known clauses affecting ownership of the property with respect to transportation improvements.

Unusual Characteristics

There are no unusual characteristics associated with the Patterson Cemetery property.

2.2.2.4 Price Cemetery (VDHR No. 044-5183/NRHP Eligible)

Relationship
Figure 2-1 shows the relationship of the Price Cemetery property to the Build Alternatives.

Area
Price Cemetery is comprised of approximately 0.23 acres of land and sits just northwest of Route 220 near Reservoir Road in Henry County. The Price Cemetery is within the indirect APE for Alternatives A, B, and C.

Ownership
Price Cemetery is privately owned and operated.

Activities
The Price Cemetery contains approximately 25 burials that date from the mid- to late-nineteenth century to the mid-twentieth century. The cemetery contains larger stones engraved with the name Price, and simple, unmarked fieldstones. The Price Cemetery was determined eligible for the NRHP in 2009 under Criterion D due to its information potential.

Access
Price Cemetery has one access from a parking area south of Reservoir Road northwest of the Norfolk Southern railroad and Route 220.

Similarly Used Lands
The Patterson Cemetery and Watkins Cemetery properties, also in Henry County, have similar uses.

Clauses Affecting Ownership
There are no known clauses affecting ownership of the property with respect to transportation improvements

Unusual Characteristics
There are no unusual characteristics associated with the Price Cemetery property.

2.2.2.5 Watkins Cemetery (VDHR No. 044-5188/NRHP Eligible)

Relationship
Figure 2-1 shows the relationship of the Watkins Cemetery property to the alternatives.

Area
Watkins Cemetery is comprised of approximately 0.99 acres of land and is situated south of Browns Dairy Road and west of Reservoir Road approximately 0.74 miles northwest of Route 220 in Henry County. The Watkins Cemetery is within the indirect APE for Alternatives A, B, and C.

Ownership
Watkins Cemetery is privately owned and operated.

Activities
The Watkins Cemetery contains approximately 44 burials, including 33 burials from the Payne Cemetery. The individuals from the Payne Cemetery were interred into the Watkins Cemetery in 2009. The Watkins Cemetery was determined eligible for the NRHP in 2009, under Criterion D for its information potential. Only two of the original interments in the Watkins Cemetery contain gravestones.

Access

Watkins Cemetery has access to a new roadway under construction that extends south and west to Route 692 (Horsepasture Price Road).

Similarly Used Lands

The Patterson Cemetery and Price Cemetery properties, also in Henry County, have similar uses.

Clauses Affecting Ownership

There are no known clauses affecting ownership of the property with respect to transportation improvements.

Unusual Characteristics

There are no unusual characteristics associated with the Watkins Cemetery property.

3. IMPACTS ON SECTION 4(f) PROPERTIES

All of the alternatives potentially require the use of Section 4(f) property, as described in this section. For the purposes of this Draft Section 4(f) Evaluation, properties and their associated impacts have been divided into two groups and discussed in the following order:

1. Those whose potential impacts are presumed to be de minimis; and
2. Those which require an avoidance alternative evaluation and potentially a least overall harm analysis.

At this stage of project development, Section 4(f) requires a greater level of engineering detail as well as a greater consideration of alternatives or revisions to alternatives that would avoid or minimize Section 4(f) impacts than laws protecting most other resources. Because of the legal standards associated with Section 4(f), decisions to impact Section 4(f) resources must be well documented, include all measures to minimize harm, and be reviewed for legal sufficiency before the NEPA process is completed. Therefore, the impacts described in this evaluation are calculated based on the planning level LOD and the conclusions drawn are based on the review of whether or not the alignments can be reasonably shifted or revised without creating impacts of an extraordinary magnitude elsewhere. While the impact information for other resources presented in the Draft EIS are based on the planning level LOD, a wider Inventory Corridor has also been developed and the information included in the respective technical reports.

The use of a wider Inventory Corridor gives the decision makers the flexibility to shift the alignment during design to minimize impacts to resources with the full knowledge of the consequences of that alignment shift. When it comes to Section 4(f), FHWA and VDOT have committed to utilizing the planning level LOD in those locations where avoidance and minimization of Section 4(f) resources is required to be considered instead of the Inventory Corridor. By taking this approach and making this commitment, the anticipated use of many Section 4(f) resources was either reduced or avoided. **Table 3-1** provides a summary of those resources included as part of this Draft Section 4(f) Evaluation. Furthermore, this commitment has also allowed for minimization of impacts to the remaining Section 4(f) properties.

Table 3-1: Section 4(f) Use

Section 4(f) Property	Acreage of Use by Alternative			Intent to Pursue *de minimis*	Acreage of Use from Preferred Alternative	*De minimis* Impact
	A	B	C			
Magna Vista High School	0	0	0	No	0	No
Belleview	0.52	8.61	0	No	0	No
Marrowbone	0	0.001	0	No	0	No
Patterson Cemetery	0	0	0	No	0	No
Price Cemetery	0	0	0	No	0	No
Watkins Cemetery	0	0	0	No	0	No

Under the regulations implementing Section 106, an "effect" is an "alteration to the characteristics of a historic property qualifying it for the National Register" [36 CFR §800.16(i)]. An effect is adverse when it alters a qualifying characteristic of the property "in a manner that would diminish the integrity of the property's location, design, setting, materials, workmanship, feeling, or association." [36 CFR 800.5(a)(1)]. The assessments of effect in this section are only preliminary and have not been coordinated with the SHPO and other consulting parties. As design and engineering of the alternatives advances, these preliminary assessments will be taken into account and efforts will be made to avoid or minimize any adverse effects. These efforts will be undertaken in consultation with the SHPO and other consulting parties to the Section 106 process, who will also be provided the opportunity to comment on final determinations of effect.

Table 3-1 lists the properties being impacted by the planning level LOD of one or more of the Build Alternatives. **Figure 3-1, Figure 3-2**, and **Figure 3-3** show the detailed impacts to historic properties.

Belleview

Alternatives A and B would result in a Section 4(f) use of the Belleview property. The use would result from the construction of the roadway. Alternative A would require acquisition of approximately 0.52 acres from the northwest portion of property for improvements at the intersection with Soapstone Road and Joseph Martin Highway. Alternative B would bisect the property and acquire approximately 8.61 acres (see **Figure 3-1**). Alternatives A and B may diminish aspects of integrity that contribute to the eligibility of Belleview, resulting in an adverse effect. Alternative C would not require a Section 4(f) use but may result in either a no effect or no adverse effect to the Belleview property.

Marrowbone

Alternative B would result in a Section 4(f) use of the Marrowbone property. The use would result from the construction of the roadway. Alternative B would require minor acquisition of approximately 0.001 acre from the southeast portion of property associated with intersection improvements along Lee Ford Camp Road (see **Figure 3-2**). Alternative B is likely to diminish the setting and feeling of the Marrowbone property, resulting in an adverse effect. Alternatives A and C would not require a Section 4(f) use but may result in either a no effect or no adverse effect to the Marrowbone property.

Patterson Cemetery

Alternatives A, B, and C would not result in a Section 4(f) use of the Patterson Cemetery property. These alternatives may result in either a no effect or no adverse effect to the Patterson Cemetery.

Price Cemetery

Alternatives A, B, and C would not result in a Section 4(f) use of the Price Cemetery property. These alternatives may result in either a no effect or no adverse effect to the Price Cemetery.

Watkins Cemetery

Alternatives A, B, and C would not directly impact the Watkins Cemetery property or result in a Section 4(f) use. These alternatives may result in either a no effect or no adverse effect to the Watkins Cemetery.

3.1 POTENTIAL *DE MINIMIS* IMPACTS

Based on the approach described above, no Section 4(f) property would incur minor impacts from the Build Alternatives based on the LOD of each alternative. FHWA does not intend to pursue a Section 4(f) *de minimis* impact finding since there is no use of any Section 4(f) property with the Preferred Alternative. Pursuant to 23 CFR 774.3(b), a Section 4(f) de minimis impact finding could apply if the alternatives under consideration in the Draft EIS have a Section 4(f) use but would not adversely affect the activities, features, or attributes that make the property eligible for Section 4(f) protection (for park properties), or in the case of historic resources, that the undertaking (study) will not result in an adverse effect pursuant to 36 CFR §800. Should the official with jurisdiction concur and after appropriate public involvement, FHWA could then issue a finding of *de minimis* impacts on an individual property basis.

Figure 3-1: Belleview Historic Property

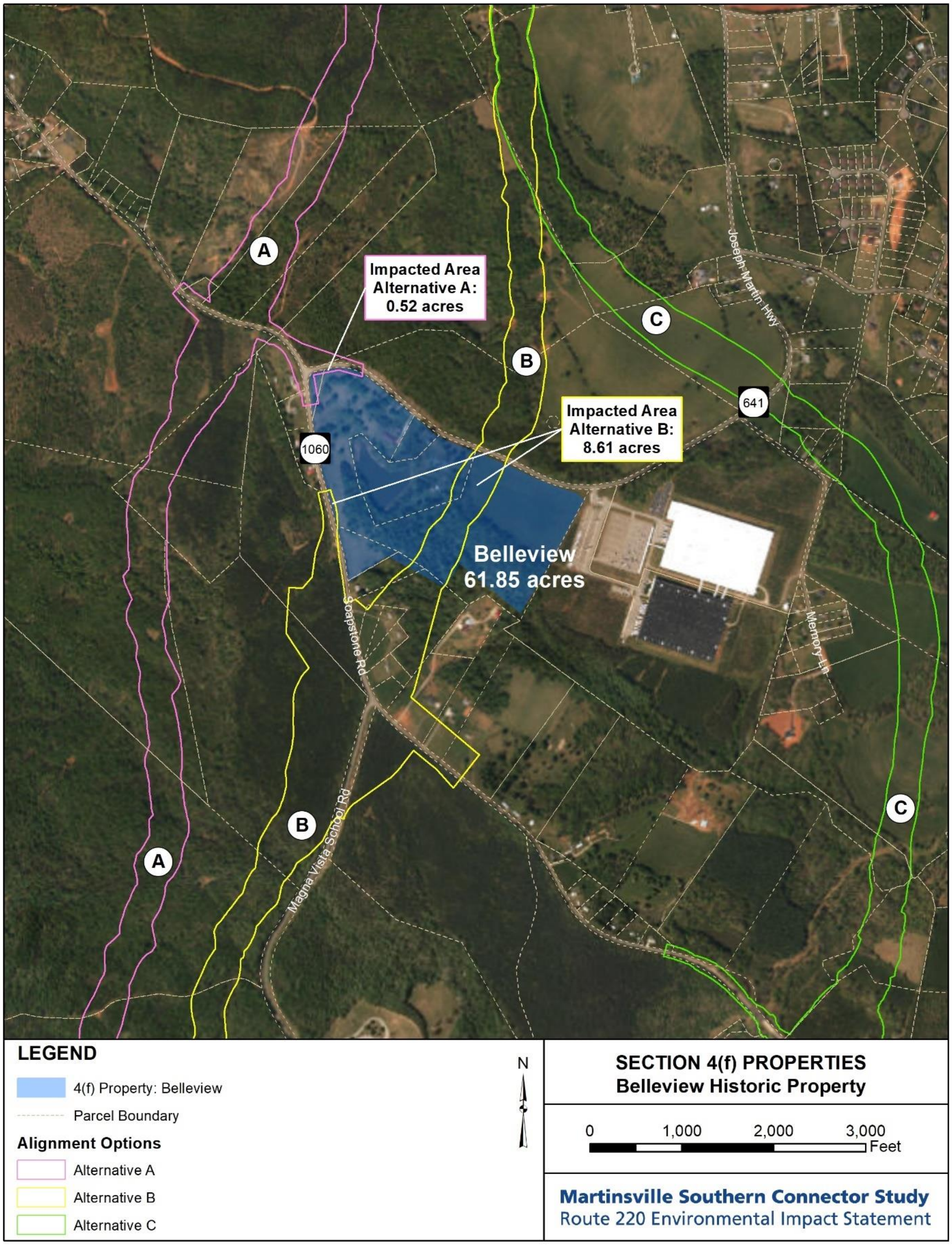
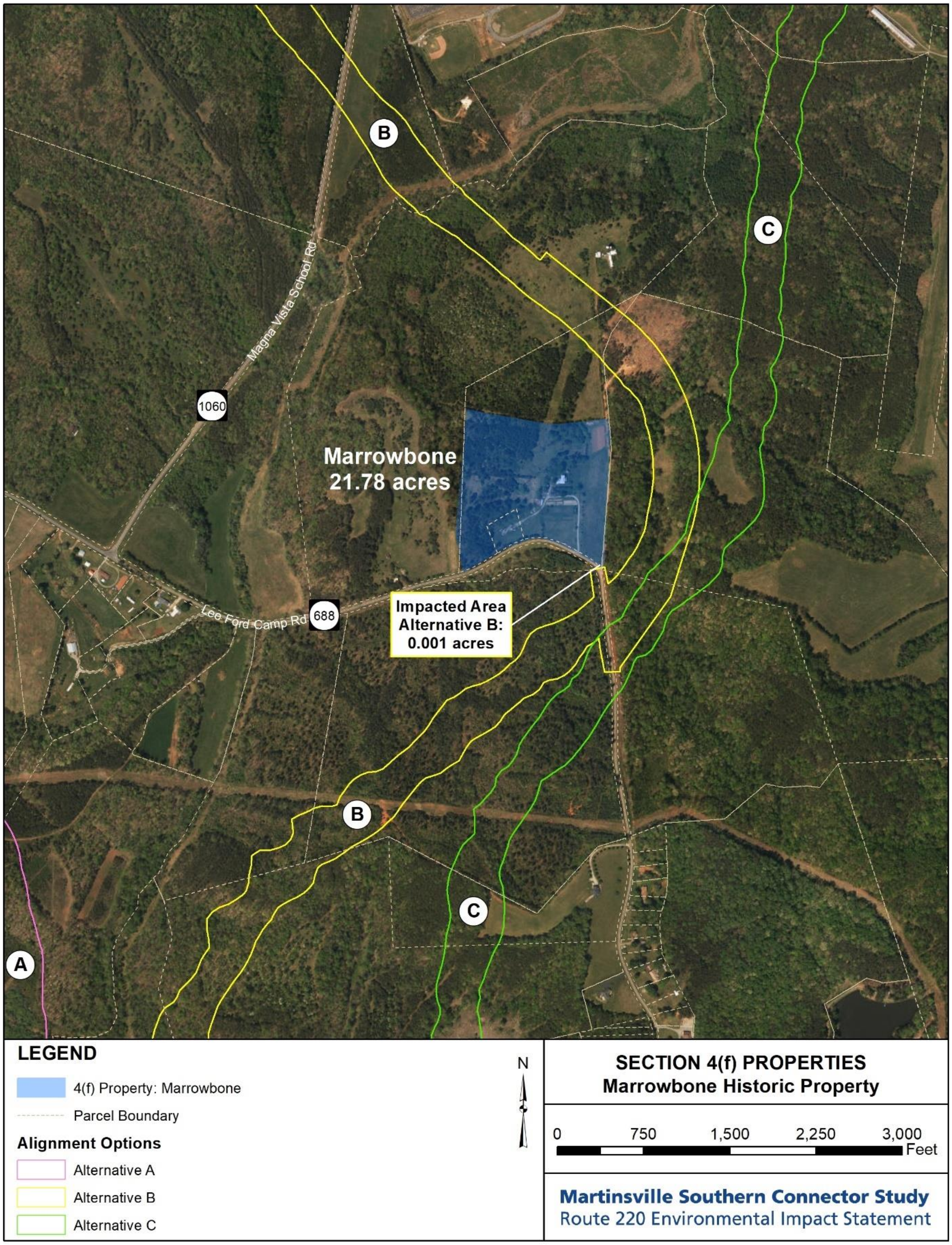


Figure 3-2: Marrowbone Historic Property



3.2 SECTION 4 (f) PROPERTY REQUIRING AVOIDANCE ALTERNATIVES EVALUATION AND LEAST OVERALL HARM ANALYSIS

This section discusses the Section 4(f) properties that would be used by an alternative planning level LOD to such a degree that the impact would adversely diminish the characteristics of the resource which qualify it for protection under Section 4(f). Accordingly, these resources have not been considered for a *de minimis* finding.

Belleview

Alternatives A and B would result in a Section 4(f) use of the Belleview property. Alternative C would not result in a Section 4(f) use of this property. The Alternative A planning level LOD alignment shows a strip of right of way would need to be acquired along Soapstone Road and Joseph Martin Highway (see **Figure 3-1**). With Alternative A, the impacted part of the property consists of vegetated buffer which would be converted to a transportation use and would require 0.52 acre of the property. The Alternative B planning level LOD alignment would bisect the property and require improvements along Soapstone Road. With Alternative B, the impacted part of the property consists primarily of forested area and vegetated buffer which would be converted to transportation use and would require 8.61 acres of the property. Alternatives A and B may diminish aspects of integrity that contribute to the eligibility of Belleview, resulting in an adverse effect.

Marrowbone

Alternative B would result in a Section 4(f) use of the Marrowbone property. The use would result from the construction of the roadway. The Alternative B planning level LOD alignment would require minor acquisition of approximately 0.001 acre from the southeast portion of property associated with intersection improvements along Lee Ford Camp Road (see **Figure 3-2**). The impacted part of the property consists primarily of vegetated buffer which would be converted to transportation use. Alternative B is likely to diminish the setting and feeling of the Marrowbone property, resulting in an adverse effect.

4. AVOIDANCE ANALYSIS

Due to the identification of Section 4(f) properties located within the planning level LOD of each alternative under consideration in the Draft EIS, avoidance options were considered. In accordance with 23 CFR §774.17, an avoidance alternative is not feasible if it cannot be built as a matter of sound engineering judgment, and an alternative is not prudent if:

1. It compromises the project to a degree that it is unreasonable to proceed with the project in light of its stated purpose;
2. It results in undesirable safety or operational problems;
3. After reasonable mitigation, it still causes:
   a. Severe social, economic, or environmental impacts;
   b. Severe disruption to established communities;
   c. Severe disproportionate impacts to minority or low income populations; or
   d. Severe impacts to environmental resources protected under other federal statutes;
4. It results in additional construction, maintenance, or operational costs of an extraordinary magnitude;
5. It causes other unique problems or unusual factors; or
6. It involves multiple factors as described above, that while individually minor, cumulatively cause unique problems or impacts of extraordinary magnitude.

4.1 LOCATION AVOIDANCE ALTERNATIVES FOR INDIVIDUAL SECTION 4(f) PROPERTIES

Alternative C has been identified as the Preferred Alternative and avoids the use of all Section 4(f) properties.

Once the public has had an opportunity to review and comment on the selection of the Preferred Alternative, VDOT and FHWA will assess the effects of the study on architectural historic properties and coordinate the findings with the SHPO and other Section 106 consulting parties. Should any of the architectural historic properties be adversely affected, FHWA and VDOT will consult with the SHPO and other parties to the Section 106 process to determine appropriate measures that would avoid, minimize, or mitigate the adverse effects. These measures would constitute commitments that would be incorporated as stipulations in a legally binding agreement document executed by the FHWA, the SHPO, the Advisory Council on Historic Preservation (ACHP), VDOT, and other parties as appropriate to conclude the Section 106 process. Presently, VDOT and FHWA anticipate that the agreement document would take the form of a Programmatic Agreement that would also stipulate the process VDOT would follow to complete efforts to identify archaeological historic properties potentially affected by the Preferred Alternative, assess the undertaking's effect on those sites, and identify measures that would resolve any adverse effects by avoiding, minimizing, or mitigating for them.

4.2 ALTERNATIVES NOT RETAINED FOR DETAILED EVALUATION IN THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

VDOT, in coordination with FHWA and the Cooperating and Participating Agencies considered a range of alignment options to evaluate under the established Purpose and Need of the project. Additional information is included in the Draft EIS and supporting ***Alternatives Analysis Technical Report*** (VDOT, 2020b) regarding the process used to identify and screen alignment options, alternatives considered and eliminated from further consideration, and alternatives carried forward for detailed study.

The following alignment options for Route 220 improvements were not evaluated in the Draft EIS:

- Alignment Option 2 –Transportation System Management and Transportation Demand Management improvements, which may include, but are not limited to geometric improvements on the existing roadway to consolidate driveway entrances and conflict points, installation of intelligent transportation systems devices and synchronized signal timings, or alternative intersection and interchange designs;
- Alternative E – previously named Alignment Option 3 – Reconstruct Route 220 as an access-controlled roadway, consolidating access to Route 220 to interchanges at select locations;
- Alternative D – previously named Alignment Option 4D – Reconstruction of Route 220 to an access-controlled roadway, with a spur on new alignment to the west, north of Ridgeway, and reconstruction of the Joseph Martin interchange at Route 220/Route 58;
- Alignment Option 5A – Reconstruction of Route 220 to an access-controlled roadway, with a spur on new alignment to the east, north of Ridgeway, and a new interchange with Route 58 approximately one mile east of the Route 220/Route 58 interchange;
- Alignment Option 5B – Reconstruction of Route 220 to an access-controlled roadway, with a spur on new alignment near Ridgeway, following the west side of the railroad to a new interchange with Route 58 approximately 0.5 miles east of the Route 220/Route 58 interchange;
- Alignment Option 5C – New access-controlled alignment east of Route 220 with a new interchange with Route 58 approximately one mile east of the Route 220/Route 58 interchange. Includes reconstruction of existing Route 220 alignment for 0.5 miles from the North Carolina state line; and
- Alignment Option 5D – New access-controlled alignment east of Route 220 with a new interchange with Route 58 at Route 650 (Irisburg Road). Includes reconstruction of existing Route 220 alignment for 0.5 miles from the North Carolina state line.

5. COORDINATION

Department of Interior (DOI) – This Draft Section 4(f) Review will be provided to the DOI for review and comment.

Officials with Jurisdiction – There are two officials with jurisdiction over park and historic properties in the study area: Henry County School Board and VDHR. This Draft EIS and Draft Section 4(f) is being circulated to the officials with jurisdiction. Coordination with the Henry County Schools included the determination that the study would not affect the Magna Vista High School recreation areas. Coordination with the VDHR has included the identification of the APE and identification of historic properties pursuant to 36 CFR Part 800. Additional coordination per the Section 106 process will continue throughout the development of the Draft EIS, and that coordination will include an effect determination.

ACHP – As appropriate, the ACHP will be notified following a determination of adverse effect to historic properties pursuant to 36 CFR Part 800 and the identification of a preferred alternative.

Locality – The study is located within Henry County and includes the Town of Ridgway. Representatives from these local governments have participated in study scoping and have been invited to be Cooperating Agencies in accordance with NEPA. The Draft EIS and Draft Section 4(f) is being circulated to both localities for review.

Public – The public has the opportunity to review and comment on this Draft Section 4(f) concurrently with the review of the Draft EIS. Comments from the public related to the Section 4(f) analysis will be responded to in the Final Section 4(f) Evaluation.

6. REFERENCES

County of Henry, Virginia (County of Henry). 2019. Budget FY 2019-2020, April 2019.

Federal Highway Administration (FHWA). 1987. *Guidance for Preparing and Processing Environmental and Section 4(f) Documents*. FHWA Technical Advisory T6640.8A. Retrieved from: https://www.environment.fhwa.dot.gov/projdev/impTA6640.asp.

Virginia Department of Conservation and Recreation (VDCR). 2019. Virginia Natural Heritage Data Explorer. Retrieved from http://www.vanhde.org/content/map.

Virginia Department of Transportation (VDOT). 2019. Six-Year Improvement Program, Fiscal Year 2020-2025 Final.

Virginia Department of Transportation (VDOT). 2020b. Martinsville Southern Connector Study Alternatives Analysis Technical Report.

Virginia Department of Transportation (VDOT). 2020d. Martinsville Southern Connector Study Natural Resources Technical Report.

Virginia Department of Transportation (VDOT). 2020g. Martinsville Southern Connector Study Noise Analysis Technical Report.

Virginia Department of Transportation (VDOT). 2020h. Martinsville Southern Connector Study Phase 1A Archeological Assessment.

Virginia Department of Transportation (VDOT). 2020i. Martinsville Southern Connector Study Architectural History Survey.

Virginia Highways Project. (2018). US Route 220. Retrieved from: http://www.vahighways.com/route-log/us220.htm

APPENDIX B

Coordination Plan

COORDINATION PLAN FOR AGENCY AND PUBLIC INVOLVEMENT

Martinsville Southern Connector Study
Route 220 Environmental Impact Statement

Federal Project Number STP-044-2(059)
State Project Number: 0220-044-052, P101; UPC: 110916
From: North Carolina State Line at Greensboro Road (U.S. Route 220) East of Martinsville
To: William F. Stone Highway (U.S. Route 58/U.S. Route 220 Bypass)
Henry County, Virginia

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION
and
VIRGINIA DEPARTMENT OF TRANSPORTATION

May 10, 2018

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

Section 1.0 PURPOSE OF COORDINATION PLAN

This Coordination Plan defines the processes and methods through which the Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), intends to communicate information and inform the development of the Martinsville Southern Connector Study. VDOT and FHWA have initiated an Environmental Impact Statement (EIS), pursuant to the National Environmental Policy Act of 1969, as amended (NEPA), to evaluate potential transportation improvements for approximately seven miles along the U.S. Route 220 corridor in Henry County, Virginia.

The process for this environmental study will be carried out following the conditions and understanding of the *National Environmental Policy Act and Clean Water Act (Section 404) Merged Process for Highway Projects in Virginia* memorandum of understanding (MOU) that was developed and agreed upon in November 2017 between VDOT, FHWA, the U.S. Army Corps of Engineers (USACE), the U.S. Environmental Protection Agency (EPA), and the U.S. Fish and Wildlife Service (USFWS). This Coordination Plan is meant to clarify how VDOT and FHWA intend on executing the study, consistent with the MOU, in order to facilitate efficient environmental reviews for project decision making, specifically the NEPA and permitting processes. Consistent with the requirements defined in 23 U.S.C. §139(g), this Coordination Plan identifies those agencies invited to be involved in the study, as well as the schedule for engaging them in the study process if they should choose to accept their invitation. The plan also identifies how comments and other information provided by agencies, stakeholders, and the public will be solicited and considered. Other coordination and communication, as necessary and dictated by the nature of the study, may occur beyond the process and schedule included in this Coordination Plan. This Coordination Plan may be updated as the study advances and any modifications shall be disseminated among the agencies, described in the sections that follow, participating in the study process and maintained publicly on the study website[1].

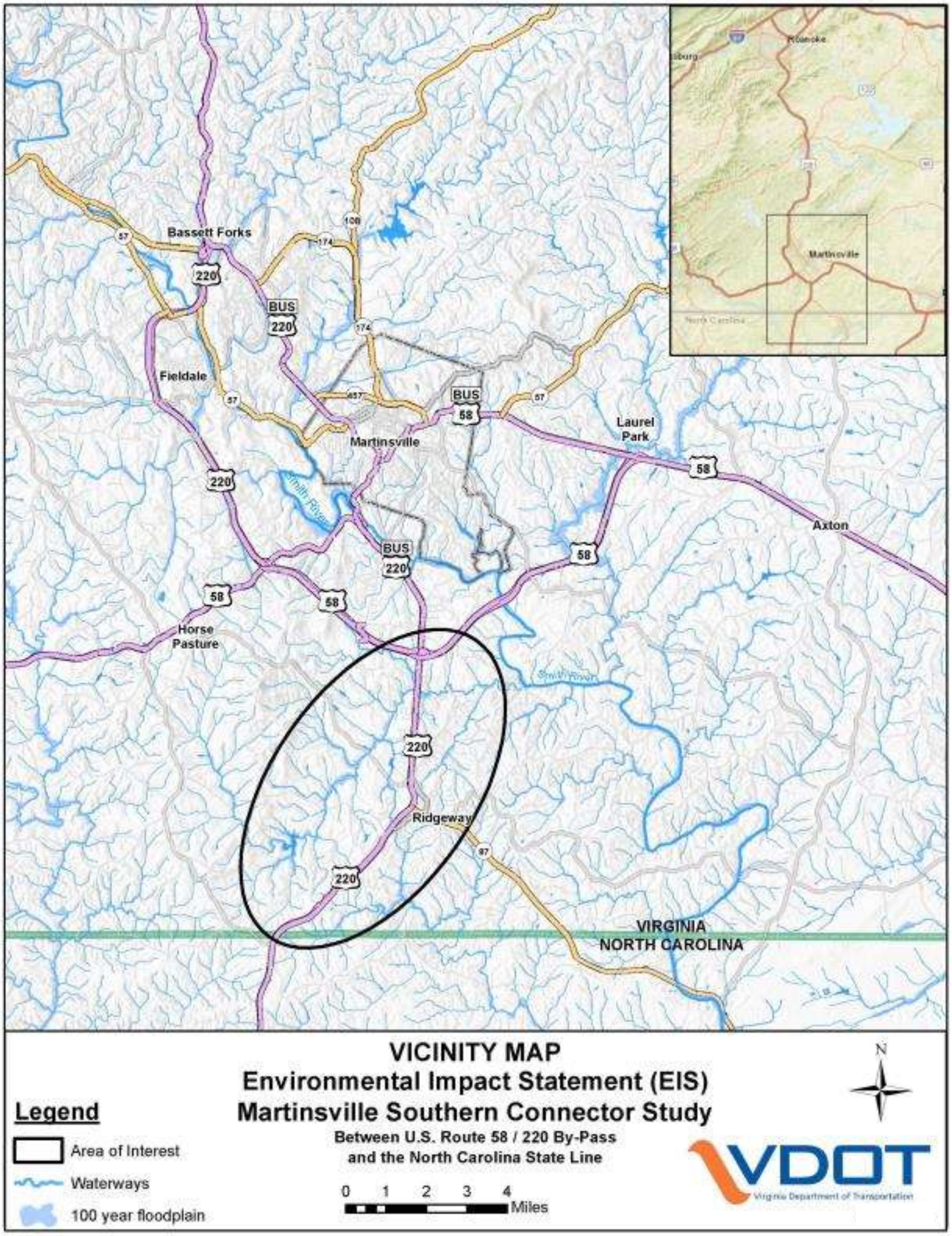
The geographic area in which this evaluation is primarily focused is shown in **Figure 1**. The specific limits of the study will be determined and refined as the environmental review process advances. The study area will be developed to ensure that a full range of relevant factors related to potential transportation needs along the corridor are considered and will be intended to encompass all reasonable resources and relevant factors that may influence the identification of needs and range of alternatives considered.

In summary, the purpose of this Coordination Plan is to:

- Identify the Federal Lead, Joint Lead, Concurring, Cooperating, and Participating Agencies in the study development process (see **Section 2.0**);
- Identify the formal concurrence points and coordination efforts (see **Section 3.0**);
- Establish the timing and format for agency involvement and collaboration throughout the NEPA process. Examples of this collaboration include, but are not limited to, defining the purpose and need and study area, determining the range of alternatives to be investigated, providing input on issues of concern and environmental features, determining the methods and data for technical analyses, and reviewing the EIS, (see **Section 3.0**);

[1] http://www.virginiadot.org/projects/salem/martinsville_southern_connector_study.asp

Figure 1. Study Area



- Establish the timing and format for the public to be involved in defining the purpose and need and study area as well as the range of alternatives to be investigated, providing input on issues of concern and environmental features, and commenting on the findings presented in the EIS (see **Section 3.0**); and
- Reflect any updates or changes to the study schedule or other items that typically require updating over the development of the environmental review.

Section 2.0 AGENCY IMPLEMENTING PROCEDURES

This section defines the agencies involved in the NEPA process and generally outlines their roles and responsibilities as Federal Lead, Joint Lead, Cooperating, Concurring, Participating, and other agencies solicited for input on the NEPA study. Specific agencies and their identified roles are listed in **Table 1**. Details on the distinctions of these identified agency roles, with respect to the implementation procedures of the study, are provided in the sections that follow and summarized in **Table 2**.

2.1 Federal Lead Agency (and Joint Lead Agency) Definition and Responsibilities

The Federal Lead and Joint Lead Agency share the primary responsibilities for facilitating the expeditious resolution of the review process and preparing an environmental document under NEPA. Because any improvements identified as a result of the study would be eligible for federal funding, FHWA is the Lead agency for the environmental review under NEPA, as well as other Federal laws such as Section 106 of the National Historic Preservation Act of 1966 and Section 7 of the Endangered Species Act. VDOT, as the direct recipient of federal funding for transportation improvements, is the Joint Lead agency for the purposes of preparing the NEPA document.

FHWA and VDOT, as the Lead and Joint Lead Agencies, share the responsibility for identifying the status and level of involvement for other agencies in the development of an efficient environmental review. This includes the identification and invitation of potential Cooperating and Participating Agencies, identified in **Table 1**. FHWA and VDOT may also invite potential Cooperating Agencies to participate in the concurrence process for the study, in accordance with the MOU. Based on their involvement in the development of the MOU, the potential Concurring Agencies considered for involvement in this study include USACE, EPA, USFWS, OEPC, and NPS. However, additional Federal agencies that accept an invitation as a Cooperating Agency may also be asked to serve as a Concurring Agency, as dictated by any individual needs or Federal approvals required specific to the study. VDOT is responsible for the distributions of invitations and confirmations to all agencies identified as potential Cooperating, Concurring, or Participating Agencies as well as providing opportunities for involvement, as indicated in the tables that follow.

Table 1. Agency Roles and Responsibilities

Agency Role	Federal Agencies	State Agencies	Local Agencies/ Other Stakeholders	Responsibilities/Involvement
Federal Lead Agency (and Joint Lead Agency)	Federal Highway Administration (FHWA)	Virginia Department of Transportation (VDOT)	N/A	Manage NEPA/Section 404 process in addition to complying with Section 7, Section 106, and other Federal laws and regulations, as appropriate; prepare Environmental Impact Statement; provide opportunity for agency involvement as well as public input.
Accepted Concurring (Cooperating) Agencies	U.S. Army Corps of Engineers (USACE)	N/A	N/A	Permitting jurisdiction under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Appropriation Act; participate in concurrence process on methodologies for environmental analysis, Purpose and Need, range of alternatives, preferred alternative (for USACE, the preliminary LEDPA; see footnote 5 on page 16), and any proposed conceptual mitigation, as well as comments on draft technical documentation and the EIS made publicly available.
	U.S. Environmental Protection Agency (EPA)	N/A	N/A	Permitting jurisdiction under Section 404/401 of the Clean Water Act as well as authority over sole source aquifers and hazardous waste sites and special expertise regarding water supply reservoirs, drinking water, air quality, and wetlands; participate in concurrence process on methodologies for environmental analysis, Purpose and Need, range of alternatives, preferred alternative, and conceptual mitigation, as well as comment on draft technical documentation and the EIS made publicly available.
Invited Concurring (Cooperating) Agencies†	*U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS), Northeast Regional Office*	*N/A*	*N/A*	*Endangered Species Act consultation and natural resource expertise; participate in concurrence process on methodologies for environmental analysis, Purpose and Need, range of alternatives, preferred alternative, and any proposed conceptual mitigation, as well as comment on draft technical documentation and the EIS made publicly available.*
Invited Cooperating Agencies†	*U.S. Department of the Interior, National Park Service (NPS)*	*N/A*	*N/A*	*Preservation of parks, recreation and cultural resources; provide comment, response, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.*
	National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA-Fisheries)	*N/A*	*N/A*	*Endangered Species Act consultation and marine resources expertise; participate in concurrence process on methodologies for environmental analysis, Purpose and Need, range of alternatives, preferred alternative, and any proposed conceptual mitigation, as well as comment on draft technical documentation and the EIS made publicly available.*

Agency Role	Federal Agencies	State Agencies	Local Agencies/ Other Stakeholders	Responsibilities/Involvement
Accepted Participating Agencies†	U.S. Department of the Interior, Office of Environmental Policy and Compliance (OEPC)	N/A	N/A	Environmental Justice, NEPA, Natural and Cultural Resource Protection; provide comment, response, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.
	U.S. Department of Transportation, Federal Rail Administration (FRA)	Virginia Department of Rail and Public Transportation (DRPT)	N/A	Public transportation coordination and oversight in the study area, railroad coordination and oversight due to the proximity of the Norfolk Southern Routes rail line included within portions of the study area; collaboration on methodologies for environmental analysis (as necessary), comment on Purpose and Need, range of alternatives, and the EIS made publicly available. Additional expertise and ridership information may be required to inform the study.
	Advisory Council on Historic Preservation (ACHP)*	N/A	N/A	Section 106 of the Historic Preservation Act jurisdiction; historic resources consultation, review, and oversight.
	U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS)	Virginia Department of Agriculture and Consumer Services (DACS)	N/A	Preservation of farmland and conservation of soil, water, air and other natural resources, including drinking water and sub-terrestrial resources; provide comment, response, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.
	U.S. Department of Agriculture, Forest Service (FS)	N/A	N/A	Management of natural resources, wildlife species, and ecosystems; provide comment, response, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.
				Management of the lands and resources of the National Forest System; provide comment, response, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.
	U.S. Department of Homeland Security, Federal Emergency Management Agency (FEMA)	N/A	N/A	Floodplain oversight, public safety, and incident management coordination; provide comment, responses, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.

Agency Role	Federal Agencies	State Agencies	Local Agencies/ Other Stakeholders	Responsibilities/Involvement
	U.S. Department of Housing and Urban Development (HUD)	N/A	N/A	Socioeconomic and environmental justice information; provide comment, response, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.
	U.S. Department of Homeland Security, Coast Guard Atlantic Area, Commander Fifth District Coast Guard	N/A	N/A	Under MOA between USCG and FHWA to coordinate bridge planning and permitting, bridge permit jurisdiction; provide comment, response, studies and methodologies on bridge/roadway approach alternatives over navigable waters; Joint Public notices and meetings, where feasible;
	N/A	N/A	Henry County Town of Ridgeway West Piedmont Planning District Commission	Locality and regional jurisdiction, transportation and planning information and technical support; provide comment, response, studies or methodologies on areas within special expertise or jurisdiction, in addition to comment on the Purpose and Need, range of alternatives, and the EIS made publicly available.
Invited Participating Agencies	*N/A*	*Virginia Department of Historic Resources (DHR)**	*N/A*	*Section 106 of the Historic Preservation Act jurisdiction; historic resources consultation, review, and oversight.*
	N/A	*Virginia Department of Mines, Minerals and Energy (DMME)*	*N/A*	*Preservation and conservation of soil, water, air and other natural resources, including drinking water and sub-terrestrial resources.*
	N/A	*Virginia Department of Conservation and Recreation (DCR)* *Virginia Department of Game and Inland Fisheries (DGIF)*	*N/A*	*Management of natural resources, wildlife species, and ecosystems.*
	N/A	*Virginia Department of Forestry (DOF)*	*N/A*	*Management of forest lands and resources.*
	N/A	*Virginia Department of Emergency Management (DEM)*	*N/A*	*Public safety and incident management coordination.*
	N/A	*Virginia Department of Housing and Community Development (DHCD)*	*N/A*	*Socioeconomic, enterprise development zone, and environmental justice information.*
	N/A	*Virginia Marine Resources Commission (VMRC)*	*N/A*	*Permit jurisdiction, natural resources and water quality expertise.*

Agency Role	Federal Agencies	State Agencies	Local Agencies/ Other Stakeholders	Responsibilities/Involvement
		Virginia Department of Environmental Quality (DEQ)		
	N/A	*Virginia Department of Health (DOH)*	*N/A*	*Public health and safety.*
	N/A	*North Carolina Department of Transportation (NCDOT)*	*N/A*	*Public transportation coordination in the study area.*
	N/A	*N/A*	*City of Martinsville*	*Locality and regional jurisdiction, transportation and planning information and technical support.*
Native American Tribes*	Delaware Nation			Historic/cultural resources review and oversight.
	Eastern Band of Cherokee Indians			
	Pamunkey Indian Tribe			

Note: Italics indicate no response to invitation received.
** Will be consulted as appropriate during the Section 106 process, separate from the NEPA coordination documented in this plan.*
† Consistent with Section 2.4, invited Federal agencies that do not respond to invitation will be considered Participating Agencies until otherwise noted.

Table 2. Agency Involvement in Study Implementation Procedures

Agency Involvement	Concurring (Cooperating) Agency	Cooperating Agency	Participating Agency	Other Agencies and Stakeholders
Providing comments and pertinent information on environmental issues and considerations to inform the development of the NEPA study.	X	X	X	X
Identifying, as early as practicable, any issues of concern regarding the project's potential environmental or socioeconomic impacts.	X	X	X	X
Providing meaningful and timely input on unresolved issues.	X	X	X	X
Participating in the NEPA process starting at the earliest possible time, specifically with regard to the development of the purpose and need statement, range of alternatives, methodologies, and the level of detail for the analysis of alternatives, identification of a preferred alternative, and any necessary mitigation.	X	X	X	
Assuming, on request of the Lead Agency, responsibility for developing information and providing technical assistance in the preparation of environmental analyses concerning those areas over which the requested agency has special expertise.	X	X		
As appropriate, adopting the NEPA document for agency decision making purposes (e.g. permitting), if the agency concludes that its comments and suggestions have been satisfied.	X	X		
Participating in the concurrence process for a study, consistent with the MOU for completing NEPA and permitting processes in Virginia.	X			

2.2 Cooperating Agencies Definition and Responsibilities

As identified in the Council of Environmental Quality (CEQ) regulations for the implementation of NEPA (40 CFR §1501.6) and in the MOU, Cooperating Agencies are those government and regulatory agencies with jurisdiction by law (e.g., with permitting or land transfer authority) or special expertise with respect to any environmental impact or resource involved in an environmental review or alternative for study[2]. While the CEQ regulations developed the Cooperating Agency concept with Federal agencies in mind, the benefits of designating State, tribal, or local agencies are similar[3]. As stated previously, FHWA and VDOT, will be responsible for identifying and inviting Cooperating Agencies to become involved in the environmental review process. For the purpose of this Coordination Plan, State and local agencies have been initially identified as Participating Agencies, whose responsibilities, similar to those of Cooperating Agencies, are described in **Section 2.4**.

Cooperating Agencies will respond in writing to the letter of invitation, by the deadline provided in the invitation, to decline or accept their role and involvement. Should a response not be transmitted to FHWA and VDOT by the deadline provided in the invitation, the identified agency will be assumed to have declined to be a Cooperating Agency but will be considered a Participating Agency (see **Section 2.3**). Upon accepting, Cooperating Agencies have the role of informing the NEPA process, starting during the scoping process, and including analysis methodologies, providing input on the Purpose and Need Statement, and the range of alternatives to be considered. Cooperating Agencies will assist in the identification of any issues regarding potential natural, social, or economic impacts. Cooperating Agencies are expected to provide input on unresolved issues within the timeframes as outlined in **Table 2**.

Cooperating Agencies may adopt the NEPA document, for the purposes of their own decision making (e.g. permit decision, etc.) without recirculation after an independent review and once the Cooperating Agency has concluded that its comments and suggestions have been satisfied.

2.2.1 Concurring Agencies Definition and Responsibilities

Concurring Agencies are those Cooperating Federal Agencies that have accepted an invitation to be involved in the concurrence process for a study, as covered by the MOU. In addition to opportunities for involvement in the study granted to Cooperating Agencies, Concurring Agencies will provide input as well as concurrence or non-concurrence on specific steps throughout the environmental review. These steps, or concurrence points, include the following:

- Scoping and environmental analysis methodologies;
- Purpose and Need;
- Alternatives development;
- Identification of preferred alternative and preliminary least environmentally damaging practicable alternative (LEDPA)[4]; and

[2] Agencies with special expertise will be invited to be a Participating Agency.

[3] FHWA's "Revised Guidance on Cooperating Agencies" (March 1992) and the CEQ's "Cooperating Agencies in Implementing the Procedural Requirements of the National Environmental Policy Act" (January 2002) indicates the importance of including State, tribal, and local government entities in the NEPA process and emphasizes the importance of Cooperating Agency status when appropriate.

[4] USACE's concurrence on a recommended preferred alternative will serve as the USACE preliminary least environmentally damaging practicable alternative (LEDPA) determination. The preliminary LEDPA concurrence

- Conceptual mitigation for project impacts.

Concurring Agencies will respond in writing to the letter of invitation, within no later than 30 days of receiving a written invitation, to decline or accept their role and involvement. Should a response not be transmitted to FHWA and VDOT within 30 days, the identified agency will be assumed to have declined to be a Concurring Agency but will be considered a Cooperating Agency. As described above, Cooperating Agencies that have declined or not responded to their invitation after the requested deadline will be considered a Participating Agency (see **Section 2.3**).

2.3 Participating Agencies Definition and Responsibilities

Participating Agencies are any Federal, State, tribal, regional, and local agencies that have an interest in the project and the environmental review process. FHWA and VDOT are responsible for identifying and formally inviting Participating Agencies to become involved in the environmental review. Utilizing Section 6002 of SAFETEA-LU (23 USC §139(d)(3)) as a guideline for defining and establishing Participating Agencies for this study, any Federal agency that is invited to participate in the environmental review process shall be designated as a Participating Agency unless the invited agency informs the lead agency, in writing, by the deadline specified in the invitation that the invited agency:

- Has no jurisdiction or authority with respect to the study;
- Has no expertise or information relevant to the study; and
- Does not intend to submit any comments on the study.

Designation as a Participating Agency does not imply project support and does not provide an agency with increased oversight or approval authority beyond its statutory limits.

Participating Agencies have the responsibility to participate in the NEPA review process, starting during the scoping process, and especially with regard to defining the purpose and need, determining the range of alternatives to be considered, methodologies, and the level of detail for the analysis of alternatives. Participating Agencies will assist in the identification of any issues regarding potential environmental or socioeconomic impacts. Participating Agencies are expected to provide meaningful and timely input on unresolved issues within requested timeframes.

2.4 Non-Cooperating/Non-Participating Agencies and Organizations

Should a Federal agency choose to decline Cooperating Agency status, that agency will be considered a Participating Agency. If a Federal agency should choose to decline both Cooperating and Participating Agency status, that agency must submit a written response stating that the agency:

- Has no jurisdiction or authority with respect to the study;
- Has no expertise or information relevant to the study; and
- Does not intend to submit any comments on the study.

---

indicates that USACE anticipates VDOT's preferred alternative would satisfy the 404(b)(1) Guidelines, although it should be noted that this concurrence is not a final permit determination and does not mean that the USACE has authorized or will authorize VDOT's preferred alternative. USACE will make a permit determination following receipt of a complete application and completion of a Public Interest Review.

In the absence of a written response, invited Federal agencies will be considered Participating. Should a state or local agency decline to provide a response to an invitation to serve as a Cooperating or Participating Agency, such agencies will be designated as non-cooperating and non-participating. All of the invited non-Cooperating or non-Participating Agencies that decline their invitations may remain involved with the NEPA process and will be included in the initial scoping outreach, points of contact for data required for the study, and furnished copies, or portions of, the EIS document for review and comment, as determined appropriate by FHWA and VDOT.

2.5 Other Interested Agencies and Organizations

2.5.1 Scoping Agencies

Federal, state, and local agencies not invited as a Cooperating or Participating Agency will be offered the opportunity to comment and provide information on environmental issues as the study is initiated, in order to help define the scope of the study. VDOT, in cooperation with FHWA, will contact these agencies through scoping letters, and email as appropriate, requesting input and feedback to be provided within the timeframe documented in the correspondence.

2.5.2 Local Agencies and Organizations

Other agencies and organizations may be identified as having an interest in the study through the public involvement process that may inform the NEPA development process. For example, an agency may have information on a particular resource within the study area. Meetings with these agencies and organizations may occur, as necessary and outside of the coordination points defined in this plan, to discuss topical information, and their role in the development of the study is expected to be informative in nature.

Section 3.0 AGENCY AND PUBLIC COORDINATION PLAN

FHWA and VDOT will provide opportunities for input on the EIS from the Cooperating, Concurring, and Participating Agencies, as well as other agencies, interested stakeholders, and the general public, in accordance with NEPA and other applicable laws and policies. The opportunities will occur at various points throughout the environmental review process. This portion of the plan outlines the coordination points through the NEPA process where opportunities for agency and public input will be provided. These general coordination points are listed below and the schedule and methods for these coordination points are outlined in **Table 3**.

- Study Initiation and Scoping Activities
- Environmental Analysis Level of Detail and Methodologies
- Development of Purpose and Need
- Identification of Range of Alternatives
- EIS Document Development and Review
- Identification of the Recommended Preferred Alternative and Conceptual Mitigation
- Final EIS/Request for FHWA Decision

Coordination and communication other than that outlined in this document is anticipated to occur, as necessary and dictated by the nature of the study. The proposed timeframes in the schedule presented below will be modified as necessary, based on agency review and discussion and as the study develops.

Table 3. Agency and Public Coordination Plan: NEPA Process[1]

Coordination Point	Approximate Date of Coordination[2]	Coordination Method	Information Included for Coordination	Agencies, Organizations, and Stakeholders Involved	Input Requested	Timeframe for Input
Study Initiation and Scoping Activities	February 22, 2018	Notice of Intent (Federal Register notification)	• Announcement of FHWA's intent to prepare EIS	All Agencies and Organizations; General Public	• Identification of pertinent issues associated with the study • Comment on scope of issues to be included in EIS	March 24, 2018
	March 27, 2018	Invitation Letter (email)	• Scoping package to introduce study and solicit input • Identification and invitation of Concurring, Cooperating, and Participating Agencies • Draft Coordination Plan for review and comment	Concurring, Cooperating, and Participating Agencies	• Input on any immediately known issues to be considered for study • Agency response confirming or declining role of Concurring Agency • Comment on draft Coordination Plan	April 27, 2018
	April 11, 2018	Agency Meeting	• Study introduction and overview of schedule • Review of draft Coordination Plan			
	May 8, 2018	Public Scoping Meeting	• Study introduction and overview of schedule	General Public	• Input on any immediately known issues to be considered for study	May 18, 2018
Environmental Analysis Methodologies	May 2, 2018	Letter (email)	• Draft environmental analysis methodologies for review and comment	Concurring, Cooperating, and Participating Agencies	• Review and comment on Environmental Analysis Methodologies, if applicable	June 1, 2018
	May 9, 2018	Agency Meeting	• Preliminary environmental resource information and available mapping • Summary of any Coordination Plan comments and revisions • Summary of environmental analysis methodologies			

Coordination Point	Approximate Date of Coordination[2]	Coordination Method	Information Included for Coordination	Agencies, Organizations, and Stakeholders Involved	Input Requested	Timeframe for Input
	May 29, 2018	Letter (email)	• Environmental analysis methodologies and request for concurrence	Concurring, Cooperating, and Participating Agencies	• Review and comment on Environmental Analysis Methodologies	June 28, 2018
	June 13, 2018	Agency Meeting	• Summary of comments from public scoping meeting • Request for concurrence on environmental analysis methodologies	Cooperating and Participating Agencies		
				Concurring Agencies	• Concurrence or non-concurrence on environmental analysis methodologies	
Purpose and Need	September 5, 2018	Letter (email)	• Study area elements of need for review and comment • Data supporting elements of need • Draft Purpose and Need Statement for review and comment	Concurring, Cooperating, and Participating Agencies	• Comment on Purpose and Need Statement for the study • Review of preliminary Purpose and Need Statement	October 5, 2018
	September 12, 2018	Agency Meeting	• Brief overview of study area history and previous studies, if applicable • Summary of draft Purpose and Need Statement			
	September – October 2018	On-line Survey, Study Website	• Study area elements of need for review and comment	General Public	• Comment on Purpose and Need Statement for the study	TBD
	September 25, 2018	Letter (email)	• Data supporting elements of need • Purpose and Need Statement and request for concurrence	Concurring, Cooperating, and Participating Agencies	• Review and comment on Purpose and Need Statement for the study	October 25, 2018
	October 10, 2018	Agency Meeting	• Summary of public survey responses • Request for concurrence on Purpose and Need Statement	Cooperating and Participating Agencies		
				Concurring Agencies	• Concurrence or non-concurrence on Purpose and Need	

Coordination Point	Approximate Date of Coordination[2]	Coordination Method	Information Included for Coordination	Agencies, Organizations, and Stakeholders Involved	Input Requested	Timeframe for Input
			• Introduction of alternative screening criteria, as applicable		Statement for the study	
Range of Alternatives	November 7, 2018	Letter (email)	• Preliminary alternative concepts for review and comment	Concurring, Cooperating, and Participating Agencies	• Review and input on alternative screening criteria, as applicable • Review and comment on preliminary alternatives for study	December 7, 2018
	November 14, 2018	Agency Meeting	• Environmental resource information and available mapping • Criteria for screening of alternatives, as applicable • Summary of preliminary alternative concepts			
	January 2019	Citizen Information Meeting	• Preliminary alternative concepts for review and comment	General Public	• Review and comment on preliminary alternatives for study	TBD
	February 6, 2019	Letter (email)	• Range of alternatives recommended to be carried forward for study • Consideration of avoidance and minimization opportunities	Concurring, Cooperating, and Participating Agencies	• Review and comment on development and range of alternatives for study	March 8, 2019
	February 13, 2019	Agency Meeting	• Summary of Citizen Information Meeting and comments received on alternatives • Summary of recommended range of alternatives • Overview of alternatives ability to address Purpose and Need			
	February 27, 2019	Letter (email)	• Range of alternatives for study and request for concurrence	Concurring, Cooperating, and Participating Agencies	• Review and comment on development and range of alternatives for study	March 29, 2019

Coordination Point	Approximate Date of Coordination[2]	Coordination Method	Information Included for Coordination	Agencies, Organizations, and Stakeholders Involved	Input Requested	Timeframe for Input
	March 13, 2019	Agency Meeting	• Request for concurrence on range of alternatives to be carried forward for evaluation in the NEPA document	Cooperating and Participating Agencies	• Review and comment on development and range of alternatives for study	
				Concurring Agencies	• Concurrence or non-concurrence on range of alternatives for study	
Draft EIS Documentation	August – November 2019	Letter (email); Agency Meeting	• Technical findings supporting the EIS • Draft sections of EIS and technical studies	All Agencies	• Comment on draft technical documents and draft sections of EIS • Comment on Draft EIS	45 Days
	January 2020	Public Hearing; Study Website	• Draft EIS and supporting technical studies	General Public	• Comment on Draft EIS	
Recommended Preferred Alternative	March – April 2020	Letter (email); Agency Meeting(s)	• Documentation and justification for recommended Preferred Alternative	Cooperating and Participating Agencies	• Input on Preferred Alternative identification • Input on conceptual mitigation, as necessary based on resource jurisdiction or expertise	30 Days
		Agency Meeting(s)	• Identification of recommended Preferred Alternative and request for concurrence	Lead (Joint Lead) Agencies and Concurring Agencies	• Identification of Preferred Alternative • Concurrence or non-concurrence on Preferred Alternative recommendation[3]	

Coordination Point	Approximate Date of Coordination[2]	Coordination Method	Information Included for Coordination	Agencies, Organizations, and Stakeholders Involved	Input Requested	Timeframe for Input
		Commonwealth Transportation Board (CTB) Meeting(s)	• Recommendation of Preferred Alternative and request for CTB location decision	Joint Lead Agency	• CTB location decision	
Conceptual Mitigation	May 2020	Letter (email); Agency Meeting(s)	• Collaboration on conceptual mitigation needs for unavoidable impacts	Cooperating and Participating Agencies	• Discuss mitigation requirements and conceptual mitigation options	30 Days
		Agency Meeting	• Conceptual mitigation and request for concurrence	Lead (Joint Lead) Agencies and Concurring Agencies	• Concurrence or non-concurrence on conceptual mitigation	
Final EIS	December 2020	Letter (email)	• Final EIS, documenting Preferred Alternative and CTB decision	All Agencies and General Public	• Comment on Final EIS	30 Days
FHWA Record of Decision	TBD	Letter (email)	• Final EIS and responses to any substantive comments received • Request for FWHA Record of Decision	Lead (Joint Lead) Agencies	• FHWA Record of Decision	TBD

[1] *Additional agency meetings and coordination, beyond the outlined schedule, will be determined as dictated by the conduct of the study and the schedule will be adjusted accordingly. It is recognized that if more than one step in the coordination process is occurring, with agencies reviewing and preparing comments or considering concurrence, longer timeframes may be needed to address the overlapping requests. Any updates to the schedule will be reflected in a revised Coordination Plan.*

[2] *Coordination dates assume meetings to occur as part of VDOT's standing monthly NEPA Programs Agency Coordination Meeting. Consistent with the merged process MOU, in general, meeting materials will be provided 15 days in advance of any meeting where concurrence will be requested. Formal comments and/or official concurrence or non-concurrence will be requested within 30 days following the distribution of meeting materials.*

[3] *See Section 2.2.1 regarding USACE concurrence with the Preferred Alternative.*

APPENDIX C

Agency Correspondence

APPENDIX C AGENCY COORDINATION

As part of the outreach efforts involved in the development of this Draft Environmental Impact Statement (EIS), the Federal Highway Administration and the Virginia Department of Transportation have participated in extensive coordination with Federal, state, and local agencies, in addition to engaging in public involvement. The table below lists the agencies and correspondence that was received over the course of the environmental study, in order to support the development of the Draft EIS and the discussions and findings therein. This appendix includes copies of the correspondence received. Additional details on the coordination efforts involved in the development of the Draft EIS are documented in **Chapter 6.0: Comments and Coordination** of the document.

ID No.	Agency	Date of Correspondence
Scoping Correspondence		
1	U.S. Army Corps of Engineers	April 24, 2018
2	U.S. Coast Guard	July 20, 2018
3	U.S. Environmental Protection Agency	April 25, 2018
4	Virginia Department of Conservation and Recreation	April 27, 2018
5	Virginia Department of Conservation and Recreation	November 19, 2018
Section 106 Consultation		
6	Virginia Department of Historic Resources (via Virginia Department of Transportation)	October 7, 2019
7	Martinsville-Henry County Historical Society (via Virginia Department of Transportation)	September 12, 2019
Threatened and Endangered Species Consultation		
8	U.S. Fish and Wildlife Service (Virginia Field Office)	October 3, 2019
9	U.S. Fish and Wildlife Service (Raleigh Field Office)	October 3, 2019
10	U.S. Fish and Wildlife Service (via email)	October 1, 2019
11	U.S. Fish and Wildlife Service	December 19, 2019
12	Virginia Department of Conservation and Recreation	April 29, 2019
13	Virginia Department of Game and Inland Fisheries (via email)	April 1, 2019
14	Virginia Department of Game and Inland Fisheries (via Virginia Department of Transportation email)	April 5, 2019
15	Virginia Department of Game and Inland Fisheries (VaFWIS Search Report)	October 3, 2019
Farmland Conversion Impact Ratings		
16	U.S. Department of Agriculture, Natural Resources Conservation Service	June 26, 2019
Land Use Pattern Assumptions		
17	West Piedmont Planning District Commission (via email)	July 23, 2019
Location Approval for the Martinsville Southern Connector Study		
18	Commonwealth Transportation Board	January 18, 2019

SCOPING CORRESPONDENCE

DEPARTMENT OF THE ARMY
US ARMY CORPS OF ENGINEERS
NORFOLK DISTRICT
FORT NORFOLK
803 FRONT STREET
NORFOLK VA 23510-1011

Reply to Attention of

April 24, 2018

Special Projects Virginia Regulatory Section
NAO-2007-00380, Martinsville Southern Connector Study
Federal Project Number: STP-044-2(059)
State Project Number: 0220-044-052, P101; UPC: 110916

Mr. Mack Frost
Environmental Specialist
Federal Highway Administration, Virginia Division
400 North 8th Street, Suite 750
Richmond, Virginia 23219-4825

Dear Mr. Frost:

This letter is in response to your letter dated March 27, 2018 soliciting scoping comments for a study you have undertaken to evaluate transportation improvements along the U.S. Route 220 corridor between the North Carolina state line to the U.S. Route 58 Bypass. The area for study is anticipated to generally encompass a portion of Henry County southeast to the City of Martinsville, roughly following Greensboro Road (U.S. Route 220) to William F. Stone Highway (U.S. Route 58/U.S. Route 220 Bypass). In accordance with the National Environmental Policy Act (NEPA), an Environmental Impact Statement (EIS) is being prepared with the Federal Highway Administration (FHWA) as the lead federal agency and the Virginia Department of Transportation (VDOT) as the Joint Lead Agency to FHWA.

It is likely the project will impact waters and/or wetlands regulated by the Norfolk District Army Corps of Engineers (USACE) under Section 10 of the Rivers and Harbors Act of 1899 and Section 404 of the Clean Water Act (33 U.S.C. 1344), and a permit or permits will likely be required. The Smith River, adjacent to the study area, is a Section 10 navigable waterway pursuant to the Rivers and Harbors Act of 1899. USACE cannot agree to the evaluation of only one alternative for the proposed project if wetlands and/or waters of the U.S. are expected to be impacted. USACE recommends the evaluation and study of additional alternatives as detailed in the itemized responses below.

USACE will participate as a cooperating agency in the preparation of the EIS and as a concurring agency as part of the merged process. We recommend coordination with the Cooperating Agencies of draft sections of the EIS prior to publishing the document. Such coordination will help to minimze future delays or problems that can be addressed earlier in the process. We wish to participate in any interagency meetings and field reviews for this project to the extent possible.

Before you develop and evaluate alternatives, waters and wetlands should be identified and mapped, and you should document how impacts to aquatic resources are avoided and minimized by the alternatives you identify. We request regular coordination with the appropriate state and Federal agencies prior to making any decisions regarding the range and elimination of alternatives. While USACE recommends a jurisidictional determination, you should consider, at a minimum, all available information such as aerial photography, U.S.G.S. quad sheets, National Wetland Inventory (NWI) maps, and soil mapping of the study area, as well as review of aerial photography (including color infrared aerials) by a qualified reviewer. Should FHWA and/or VDOT perform the assessment of jurisdictional areas through remote sensing, USACE recommends field verification of any areas which FHWA and/or VDOT notes need further evaluation. The more accurate the delineation, the better for the purposes of alternative analysis and project development that incorporates avoidance and minimization of aquatic resources. USACE understands that due to the purpose of improving an existing roadway, alternative options may be constrained. However additional alternatives must be developed and examined to include options that are in accordance with the Virginia Access Management Regulations (24 VAC 30-73).

Our records indicate an older VDOT mitigation site in the vicinity of the project, further to the west on Route 58 (VMRC # 90-0699). We recommend coordination with local VDOT district offices to insure identification of any VDOT mitigation sites and/or preservation sites within the study area. Measures to avoid and minimize impacts to streams and wetlands, such as bridging and alignment shifts, should be incorporated wherever practicable, and the environmental document should discuss avoidance and minimization measures considered. Relocation of streams should be avoided as should all impacts to any prior mitigation areas. All stormwater facilities should be located outside of jurisdictional areas.

Our regulations require that we consider a full range of public interest factors and conduct an alternatives analysis in order to identify the least environmentally damaging practicable alternative (LEDPA), which is the only alternative we can authorize.

In addition to wetland and waters impacts, we must consider factors such as land use (including displacements of homes and businesses), floodplain hazards and values, water supply and conservation, water quality, safety, cost, economics, threatened and endangered species, historic and cultural resources, and environmental justice.

Identifying potential compensation for stream and wetland impacts early in the process of project development is critical. Wetland impacts are typically compensated at 2:1 for forested, 1:5:1 for scrub/shrub, and 1:1 for emergent. Typically, we require stream compensation for unavoidable stream impacts to greater than 300 linear feet of stream at a crossing. However, we also consider the cumulative impacts to streams from a given project, and may require compensation for shorter lengths of stream if there are many impacts at close proximity, or if there are multiple impacts to the same stream and/or its direct tributaries. We encourage natural channel design to the extent practicable for streams that must be relocated. We utilize the Unified Stream Methodology for determining how much stream compensation is required for projects. The use of mitigation bank credits or Virginia Aquatic Resources Trust Fund released credits within the watershed are the preferred methods for providing compensation for stream and wetland impacts. This proposed study area encompasses one watershed, Upper Dan, HUC 03010103.

The proposed project encompasses both Norfolk District's boundaries as well as the Wilmington District (if any alternatives extend south of the state line). To avoid multiple USACE responses for this project to the extent possible, Norfolk District anticipates it will be the lead within USACE.

As part of the Corps of Engineers designation of lead federal agency authority, please note the following:

The proposed project may affect historic and cultural resources. Many projects funded by the Federal Highway Administration (FHWA) require permits from the Corps of Engineers. These projects are subject to compliance with Section 106 of the National Historic Preservation Act of 1966.

According to 36 CFR 800.2(a)(2):

"…If more than one Federal agency is involved in an undertaking, some or all [of] the agencies may designate a lead Federal agency, which shall identify the appropriate official to serve as the agency official who shall act on their behalf, fulfilling their collective responsibilities under section 106. Those Federal agencies that do not designate a lead Federal agency remain individually responsible for their compliance with this part."

Pursuant to the above provision, FHWA is hereby designated as the lead federal agency to fulfill the collective Federal responsibilities under Section 106 for the following undertaking:

Martinsville Southern Connector Study (UPC: 110916)

The Corps authorizes FHWA to conduct Section 106 coordination on its behalf, including all required tribal coordination. Any Memorandum of Agreement prepared by FHWA under 36 CFR 800.6 should include the following clause in the introductory text:

> *"WHEREAS, pursuant to Section 10 and/or Section 404 of the Clean Water Act, a Department of the Army permit will likely be required from the Corps of Engineers for this project, and the Corps has designated FHWA as the lead federal agency to fulfill federal responsibilities under Section 106; and*

In accordance with 50 CFR 401.07, FHWA is also designated as the lead Federal agency for consultation with the U. S. Fish and Wildlife Service concerning potential effects to Federally-listed threatened and endangered species.

We appreciate your consideration including USACE in the early planning stages of this study and look forward to working with you.

Should you have any questions, you may contact Ms. Lee Fuerst at 757-201-7832 or lee.fuerst@usace.army.mil.

Sincerely,

Kimberly A. Prisco-Baggett

Kimberly A. Prisco-Baggett, MBA
Chief, Special Projects Section

cc:
Mr. Michael W. Gray, Virginia Department of Transportation, Salem District
Ms. Jennifer Salyers, Virginia Department of Transportation
Mr. Caleb Parks, Virginia Department of Transportation
Mr. Mark Holma, Virginia Department of Historic Resources
Ms. Barbara Okorn, U.S. Environmental Protection Agency
Ms. Alison Whitlock, U.S. Fish and Wildlife Service
Mr. Cody Boggs, Virginia Department of Environmental Quality

U.S. Department of Homeland Security

United States Coast Guard

Commander
United States Coast Guard
Fifth Coast Guard District

431 Crawford Street
Portsmouth, VA 23704-5004
Staff Symbol: dpb
Phone: (757) 398-6422
Fax: (757) 398-6334
Email: Martin.A.Bridges@uscg.mil
or CGDFiveBridges@uscg.mil

16593
20 JUL 2018

RECEIVED
JUL 26 2018
BY:

Mr. Caleb Parks
Virginia Department of Transportation
Environmental Division
1401 East Broad Street
Richmond, VA 23219

Dear Mr. Parks:

This is in response to your request for review of the Coast Guard jurisdiction regarding the Environmental Impact Statement (EIS), to evaluate potential transportation improvements along the U.S. Route 220 corridor. The corridor consists of approximately seven miles between the North Carolina State Line at Greensboro Road (U.S. Route 220), east of Martinsville, Virginia, to the William F. Stone Highway (U.S. Route 58/U.S. Route 220 bypass), at Henry County, VA. A navigable determination and comments are unnecessary because the project area does not cross a navigable waterway.

The fact that a Coast Guard bridge permit is not required does not relieve you of the responsibility for compliance with the requirements of any other Federal, State, or local agency who may have jurisdiction over any aspect of the project.

If you have any further questions, please contact Mr. Martin Bridges at the above listed address or telephone number.

Sincerely,

HAL R. PITTS
Bridge Program Manager
By direction

Copy: CG Sector Hampton Roads, Waterways Management

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION III
1650 Arch Street
Philadelphia, Pennsylvania 19103-2029

April 25, 2018

Mr. Mack Frost
Environment Specialist
Federal Highway Administration, Virginia Division
400 North 8th Street, Suite 750
Richmond, Virginia 23219-4825

RE: Martinsville Southern Connector Study, Environmental Impact Statement (EIS) scoping

Dear Mr. Frost:

EPA has reviewed your letter dated March 13, 2018 regarding the Martinsville Southern Connector Study. The proposed Environmental Impact Statement (EIS) will evaluate potential transportation improvements along the Route 220 corridor between the North Carolina state line and the U.S. Route 58 Bypass in Henry County, Virginia. We understand that the study is being done in compliance with the National Environmental Policy Act (NEPA) and CEQ regulations implementing NEPA. Please find below recommendations for the scope of analysis for the proposed study.

- The EIS should include a clear and robust justification of the underlying purpose and need for the proposed action. The purpose and need statement is important to explain why the proposed action is being undertaken and what objectives the project intends to achieve. The purpose of the proposed action is typically the specific objective of the activity. The need should explain the underlying problem for why the project is necessary.
- We suggest that updated mapping of community and environmental features be shared with the cooperating agencies prior to the development of purpose and need and refined as additional data is obtained.
- We suggest the EIS clearly explain this project in relation to the previous I-73 corridor project.
- Alternatives analysis should include the suite of activities or solutions that were considered and the rationale for not carrying these alternatives forward for detailed study.
- The document should describe potential impacts to the natural and human environment. Existing resources should be identified and EPA encourages that adverse impacts to natural resources, especially wetlands and other aquatic resources, be avoided and minimized.
- A robust narrative describing aquatic resources and functions should be included in the EIS. We suggest at a minimum, a narrative should be provided that includes: a discussion of hydrology, including sources and direction of flow; the vegetative communities in the impact area, including size of trees (dbh), percent canopy cover, understory and other components such as woody debris and snags, and presence of invasive species; soil type(s); and an assessment of expected functions based on the HGM type, ecological community, and surrounding land-use. Photos

should be included. The Route 460 EIS study methodology should be considered a template. Some information on resources may be gained from public websites including:

  - EnviroMapper[1]: https://www.epa.gov/waterdata/waters-watershed-assessment-tracking-environmental-results-system
  - Envirofacts[2]: https://www3.epa.gov/enviro/
  - NEPAssist[3]: https://www.epa.gov/nepa/nepassist
  - 303(d) Listed Impaired Waters: https://www.epa.gov/exposure-assessment-models/303d-listed-impaired-waters
  - Watershed Resources Registry: https://watershedresourcesregistry.org/index.html. This newly released mapping and screening tool prioritizes areas for preservation and restoration of wetlands, riparian zones, terrestrial areas, and stormwater management across several states in the mid-Atlantic region, including Pennsylvania. This tool is useful for planners to access environmental data to avoid impacting natural areas and identify optimal mitigation areas.

- Stormwater ponds, best management practices (BMPs) and construction staging areas should not be located in wetlands and streams. Stormwater management alternatives that address the existing and new construction should be considered and are encouraged.
- For this or future projects, please consider the following: to reduce runoff volume and improve water quality, EPA recommends where possible the incorporation of Low Impact Development (LID) design features. Technical guidance in implementing green infrastructure (GI) practices and LID can be found at: https://19january2017snapshot.epa.gov/sites/production/files/2015-09/documents/eisa-438.pdf and www.epa.gov/greeninfrastructure. We suggest LID options be considered for design of features such as parking, paving, and landscaping. Other information can be found at www.epa.gov/nps/lid ; U.S. EPA's Smart Growth Website: www.epa.gov/smartgrowth ; and the International Stormwater BMP Database: http://www.bmpdatabase.org
- EPA suggests coordinating with other appropriate federal, state and local resource agencies on possible impacts to wetlands, streams and/or rare, threatened and endangered species. As needed, assessment of aquatic resources functions should be provided. We would be pleased to coordinate with VDOT and the U.S. Army Corps of Engineers on this work.
- An evaluation of air quality and community impacts, including noise, light and possible traffic impacts, should be included in the document. General conformity status should be included in the document.
- The EIS should include an analysis of any hazardous sites or materials, and the status of any ongoing or past remediation efforts in the project area. This includes any groundwater contamination.
- We recommend the EIS include consideration of extreme weather events in particular in association with resiliency design.
- The document should address potential indirect and cumulative effects in the project areas; the cumulative impact analysis should evaluate impacts to environmental resources that have the potential to be impacted by the project (i.e. wetlands, surface water, etc). Analysis may aid in the identification of resources that are likely to be adversely affected by multiple projects, and sensitive resources that could require additional avoidance or mitigation measures. It is suggested that a secondary and cumulative effects analysis begin with defining the geographic

and temporal limits of the study; this is generally broader than the study area of the project. EPA recommends that methodology be discussed with the interagency team early in EIS development.

- The EIS should discuss how the project will tie in to the transportation system in North Carolina and analyze potential impacts.

Thank you for coordinating with EPA on this project. We look forward to working with you as more information becomes available. Please let me know if you have any questions on the recommended topics above.

Sincerely,

Barbara Rudnick
NEPA Program Manager
Office of Environmental Programs

1 The Watershed Assessment, Tracking & Environmental Results System (WATERS) unites water quality information previously available only from several independent and unconnected databases
2 Includes enforcement and compliance information
3 NEPAssist is a tool that facilitates the environmental review process and project planning in relation to environmental considerations. The web-based application draws environmental data dynamically from EPA Geographic Information System databases and web services and provides immediate screening of environmental assessment indicators for a user-defined area of interest. These features contribute to a streamlined review process that potentially raises important environmental issues at the earlier stages of project development.

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Thomas L. Smith
Deputy Director of Operations

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

MEMORANDUM

DATE: April 27, 2018

TO: Caleb Parks, VDOT

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: VDOT 0220-044-052, P101, UPC 110916, Martinsville Southern Connector Study

Division of Natural Heritage

The Department of Conservation and Recreation (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Biotics historically documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Many invasive plant species are adapted to take advantage of soil disturbances and poor soil conditions. These adaptations are part of what enable certain species to be invasive. Non-native invasive plants are found through Virginia. Therefore, the potential exists for some VDOT projects to further the establishment of invasive species. To minimize the potential for invasive species infestation, projects should be conducted to minimize the area of disturbance, and disturbed sites should be revegetated with desirable species at the earliest opportunity following disturbance. Equally as important, species used for revegetation should not include the highly invasive species that have traditionally been used for revegetating disturbed sites. We recommend VDOT avoid using crown vetch, tall fescue, and autumn olive if at all possible.

For more information on invasive alien plants and native plants, see the DCR-Division of Natural Heritage website http://www.dcr.virginia.gov/natural-heritage/invspinfo.shtml. For sources of native plant material, see the Virginia Native Plant Society's website (http://vnps.org) or the U.S. Fish and Wildlife Service nursery list for Virginia (http://www.fws.gov/ChesapeakeBay/BayScapes/bsresources/bs-nurseries.html).

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

All VDOT projects on state-owned lands must comply with the Virginia Erosion & Sediment Control (ESC) Law and Regulations, the Virginia Stormwater Management (SWM) Law and Regulations, the most current version of the DCR approved VDOT Annual ESC and SWM Specifications and Standards, and the project-specific ESC and SWM plans. [Reference: VESCL §10.1-560, §10.1-564; VESCR §4VAC50-30 et al; VSWML §10.1-603 et al; VSWMR §4VAC-3-20 et al].

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis, or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov. According to the information currently in our files, the Smith River, which has been designated by the Virginia Department of Game and Inland Fisheries (VDGIF) as a "Threatened and Endangered Species Water" for the Roanoke logperch is within 2 miles of the project area. Therefore, DCR recommends coordination with the U.S. Fish and Wildlife Service (USFWS) and Virginia's regulatory authority for the management and protection of this species, the VDGIF, to ensure compliance with protected species legislation.

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

Cc: Ernie Aschenbach, VDGIF
Troy Andersen, USFWS

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Thomas L. Smith
Deputy Director of Operations

COMMONWEALTH of VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

MEMORANDUM

DATE: November 19, 2018

TO: Angel Aymond, VDOT

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: Martinsville Southern Connector Study, Preliminary Alignment Options - Alternatives

Division of Planning and Recreation Resources

The Department of Conservation and Recreation (DCR), Division of Planning and Recreational Resources (PRR), develops the *Virginia Outdoors Plan* and coordinates a broad range of recreational and environmental programs throughout Virginia. These include the Virginia Scenic Rivers program; Trails, Greenways, and Blueways; Virginia State Park Master Planning and State Park Design and Construction.

Our comments are based upon a general review of the multiple potential routes for the southern connector study. We understand that the given alignments are 300 feet wide in an effort to give us an idea of possible routes. According to our review, Fisher Farm Park, a 6(f) property, is within the study area as is Gravely Nature Preserve, 4(f), and several other Henry County local parks. Fairy Stone State Park is in proximity to the Study Area but we do not anticipate impacts to Fairy Stone given the distance to the potential routes. At this time, we are recommending coordination with the county regarding potential impacts to their local parks. Further, we ask for continued coordination with this office, as an alignment selection is refined.

Division of Natural Heritage

The Department of Conservation and Recreation's Division of Natural Heritage (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

According to the information currently in our files, Smith River Slopes and Bluffs Conservation Site is located within the proposed alignment of Alternative 6D. Conservation sites are tools for representing key areas of the landscape that warrant further review for possible conservation action because of the natural heritage resources and habitat they support. Conservation sites are polygons built around one or more rare plant, animal, or natural community designed to include the element and, where possible, its associated habitat, and buffer or other adjacent land thought necessary for the element's conservation. Conservation sites are given a biodiversity significance ranking based on the rarity, quality, and number of element occurrences they contain; on a scale of 1-5, 1 being most significant. Smith River Slopes and Bluffs Conservation Site has been given a biodiversity significance ranking of B3, which represents a site of high significance. The natural heritage resource of concern at this site is:

Northern Coastal Plain / Piedmont Oak – Beech / Heath Forest G4/S3/NL/NL

Northern Coastal Plain / Piedmont Oak - Beech / Heath Forests are widely but locally distributed in small to occasionally large patches across much of the Piedmont and dissected, inner Coastal Plain in Virginia. Similar forests are known from North Carolina, South Carolina, and Maryland. This community type is particularly common on steep ravine slopes and bluffs of dissected terrain with highly acidic soils. It occurs occasionally on short, steep bluffs of the Outer Coastal Plain, and occasionally occurs on elevated swamp islands with sandy, oligotrophic soils (NatureServe, 2013). Over most of the state, white oak (*Quercus alba*), northern red oak (*Quercus rubra*), chestnut oak (*Quercus montana*, = *Quercus prinus*), and American beech (*Fagus grandifolia*) are the major overstory trees. Eastern hemlock (*Tsuga canadensis*) and sweet birch (*Betula lenta*) are occasional associates in the Piedmont. Sourwood (*Oxydendrum arboreum*), blackgum (*Nyssa sylvatica*), red maple (*Acer rubrum*), and American holly (*Ilex opaca* var. *opaca*) are common understory trees. Dense colonies of mountain-laurel (*Kalmia latifolia*) or, very locally, great rhododendron (*Rhododendron maximum*) form a continuous shrub layer. Few herbaceous species occur in the stands. On very steep and rocky bluffs, tree canopies may be quite open as the result of poor establishment and frequent downfalls. Communities in this group are similar to Mesic Mixed Hardwood Forests but usually occupy drier, steeper sites that support fewer mesophytic plants and a greater abundance of heaths. (Fleming, et al., 2012)

In addition, the Smith River, which has been designated by the Virginia Department of Game and Inland Fisheries (VDGIF) as a "Threatened and Endangered Species Water" is within the proposed alignment of Alternative 6D. The species associated with this T & E Water is the Roanoke logperch.

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

The Virginia Department of Game and Inland Fisheries (VDGIF) maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis/ or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov.

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

Literature Cited

Fleming, G.P., K.D. Patterson, K. Taverna, and P.P. Coulling. 2012. The natural communities of Virginia: classification of ecological community groups. Second approximation. Version 2.5. Virginia Department of Conservation and Recreation, Division of Natural Heritage, Richmond, VA.

SECTION 106 CONSULTATION

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219-2000

Stephen C. Brich, P.E.
COMMISSIONER

September 12, 2019

ROUTE:	Martinsville Southern Connector
PROJECT:	0220-044-052; UPC: 110916
COUNTY/CITY:	Henry County
FUNDING:	Federal
VDHR FILE:	2019-0226
ACTION REQUIRED:	Determination of Eligibility

Ms. Julie V. Langan, Director
Attn.: Mr. Marc Holma, Office of Review and Compliance
Virginia Department of Historic Resources
2801 Kensington Avenue Richmond,
VA 23221

Dear Mr. Holma:

The Federal Highway Administration (FHWA), in coordination with the Virginia Department of Transportation (VDOT), is preparing an Environmental Impact Statement (EIS) to evaluate potential transportation improvements known as the Martinsville Southern Connector. The EIS is being prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and will analyze options to develop a limited-access facility between the Route 58/220 By-pass, on the south side of the City of Martinsville, and the North Carolina state line for a distance of approximately seven miles.

The VDOT is coordinating this federally-funded this project with the Virginia Department of Historic Resources (VDHR) in accordance with Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended, and its implementing regulations, 36 CFR Part 800. The purpose of this letter is to coordinate the National Register eligibility of architectural resources located within the APE for the project.

Project Description

The VDOT coordinated the APE for the Martinsville Southern Connector (MSC) with the VDHR in April 2019. At that time, the VDOT outlined transportation needs identified for the MSC study and presented five potential alternatives. Since this initial coordination with your agency, Build Alternatives A, B, and C have moved forward as potential preferred alternatives. Build Alternatives D and E have been eliminated as possible alternatives.

Alternative A, New Alignment of Existing U.S. Route 220

Approximate Length: 7.7 Miles
Southern Terminus: U.S. Route 220 at North Carolina state line
Northern Terminus: New interchange one mile west of U.S. Route58/Joseph Martin Highway Interchange
Alternative B is a new western alignment that follows existing U.S. Route 220 for Approximately 1.4 miles, before shifting to the west.

Alternative B, New Alignment West of Existing U.S. Route 220

Approximate Length: 7.3 Miles
Southern Terminus: U.S. Route 220 at North Carolina state line
Northern Terminus: U.S. Route 58/Joseph Martin Highway Interchange
Alternative B is a new western alignment that follows existing U.S. Route 220 for Approximately 1.4 miles, before shifting to the west.

Alternative C, New Alignment West of Existing U.S. Route 200

Approximate Length: 7.4 Miles
Southern Terminus: U.S. Route 220 at North Carolina state line
Northern Terminus: U.S. Route 58/Joseph Martin Highway Interchange
Alternative C is a new western alignment that follows existing U.S. Route 220 For approximately 1.4 miles, before shifting to the west.

Consulting Parties

The VDOT reached out by letter to the following parties to determine whether they wished to participate in Section 106 consultation on the MSC:

36 CFR 800.2(c)(2) Indian Tribes and Native Hawaiian Organizations

Pamunkey Tribe
Chickahominy Indian Tribe
Chickahominy Indian Tribe – Eastern Division
Upper Mattaponi Indian Tribe
Rappahannock Tribe
Monacan Indian Nation
Nansemond Indian Tribal Association
Catawba Indian Nation
Delaware Nation

36 CFR 800.2(c)(3) Representatives of Local Governments

Henry County
City of Martinsville
Town of Ridgeway

36 CFR 800.1(c)(5) Additional Consulting Parties

Martinsville-Henry County Historical Society
Bassett Historical Center
Preservation Virginia

Of these parties, only the Martinsville-Henry County Historical Society responded to confirm its interest in participating in consultation. None of the tribes listed above responded to VDOT's consulting party request.

Area of Potential Effects

The Area of Potential Effect (APE) is defined as the "geographic area or areas within which an undertaking may directly or indirectly cause alterations in the character or use of historic properties, if any such properties exist" (36 CFR 800.16(d)).

The APE for architecture and archaeology may be found on page 2 of the enclosed report *Martinsville Southern Connector Study Architectural History Survey.* The VDOT coordinated the direct and indirect APE with your office in May 2019.

Identification of Architectural Historic Properties

The architectural and archaeological fieldwork for this project was completed by AECOM in May and June 2019. The results of the survey may be found in the enclosed reports *Martinsville Southern Connector Study Architectural History Survey Henry County, Virginia* and *Phase IA Archaeological Assessment Martinsville Southern Connector Study Henry County, Virginia.* Included with these reports are completed Virginia Cultural Resources Inventory System (V-CRIS) forms, site plans, and photos for each architectural resource surveyed during the course of this project. The work completed for this project meets the standards set forth in the Virginia Department of Historic Resources (DHR)'s *Guidelines for Conducting Historic Resources Survey in Virginia (2011)* and the *Programmatic Engineers, Norfolk District, the Tennessee Valley Authority, the Advisory Council on Historic Preservation, the Virginia State Historic Preservation Officer, and the Virginia Department of Transportation Regarding Transportation Undertakings Subject to Section 106 of the National Historic Preservation Act of 1966,* executed August 2, 2016 ("2016 Federal PA").

Previously Recorded Architectural Resources

There are 14 previously recorded architectural resources within the project APE. Five of those previously recorded architectural resources were recommended eligible for the National Register of Historic Places (NRHP) and these resources remain eligible for the NRHP. The eligible resources include Belleview (VDHR No. 044-0002), a late-eighteenth century dwelling that is listed on the NRHP under Criterion C for architecture. Marrowbone (VDHR No. 044-0009) is a late-nineteenth century dwelling that is eligible for the NRHP. The remaining resources are all cemeteries; the cemetery (VDHR No. 044-5182), cemetery (VDHR No. 044-5183), and the Watkins Cemetery (VDHR No. 044-5188). All the cemeteries have been determined eligible for the NRHP under Criterion D for information potential.

Table 1. Previously Recorded Architectural Resource within Project APE

VDHR Resource Number	Resource Name	Eligibility Recommendation
044-0002	Belleview	Listed NRHP
044-0009	Marrowbone	Eligible
044-0018	Magna Vista	Not Eligible
044-0117	Marrowbone Creek Bridge Area	Site not evaluated, this is an archaeological site that was given an architectural resource number.
044-5146	Price Home	Not Eligible
044-5182	Cemetery	Eligible
044-5183	Cemetery	Eligible
044-5184	Payne Cemetery	Not Eligible
044-5185	Barn	Not Eligible, demolished
044-5186	Farmstead	Not Eligible, demolished
044-5187	Barn	Not Eligible
044-5188	Watkins Cemetery	Eligible
044-5455	Tobacco Barn	Not Eligible, demolished
044-5456	Tobacco Barn	Not Eligible, demolished

Newly Identified Architectural Resources

A total of 124 newly identified architectural resources were surveyed during the course of the fieldwork for this project. These resources all fall within the VDHR approved APE for the project and have a construction date of 1978 or earlier. A majority of the newly identified architectural resources a residential dwellings and small, family cemeteries. In addition there is one apartment building (VDHR No. 044-5681), a mobile home park (VDHR No. 044-5683), two commercial buildings (VDHR Nos. 044-5689 and 044-5733), two sheds (VDHR Nos. 044-5703 and 044-5706), a garage (VDHR No. 044-5754), a mobile home (VDHR No. 044-5704), and a barn (VDHR No. 044-5775).

AECOM recommended two newly identified resources eligible for the NRHP. The first is the Redd Family Cemetery (VDHR No. 044-5695) which the consultant recommends eligible for the NRHP under Criterion D for information potential regarding Major John Redd. Major John Redd was a Revolutionary War soldier and a member of the Virginia legislature. Historically, John Redd is associated with the Belleview property (VDHR No. 044-0002), a National Register listed property also surveyed for this project. Based on Criteria Consideration C, a cemetery may only be eligible regarding a particular individual "if there is no appropriate site or building associated with his/her productive life." In this instance, Belleview is a better choice to represent the history and accomplishments of John Redd. Therefore, the VDOT is recommending that the Redd Family Cemetery is not individually eligible for the NRHP under Criteria A, B, C, or D. There is no known association with important people or events. The property resource type is common, the design and workmanship undistinguished, and the materials stock. The Redd Family Cemetery does not have the potential to yield information concerning John Redd.

The second architectural resource recommended eligible for the NRHP by AECOM is the log cabin at 10025 Greensboro Road (VDHR No. 044-5731). The consultant recommended the log cabin individually eligible for the NRHP under Criterion C for architecture as a rare example of an eighteenth century building type. AECOM acknowledges that the log cabin was moved to its present location; however, the property retains integrity of materials, design, workmanship, and feeling. The VDOT recommends that the log cabin is not individually eligible for the NRHP. The property was moved from its original location, the windows are modern, and the chimney has been rebuilt, as has the stone foundation. Based on Criteria Consideration B, a building may be considered eligible for the NRHP if it has been moved from its original location due to its "significant architectural value, or . . . is the surviving structure most importantly associated with a historic person or event." The VDOT maintains that the log cabin does not meet that threshold for architectural importance or association with a historic person or event. Therefore, the VDOT recommends that the log cabin is not individually eligible for the NRHP under Criteria A, B, C, or D. There is no known association with important people or events. The property resource type is common, the design and workmanship undistinguished, and the materials stock. Finally, the log cabin does not have the potential to yield information.

None of the newly identified architectural resources within the project APE are recommended individually eligible for the NRHP under Criteria A, B, C, or D. There is no known association with important people or events. The property resource type is common, the design and workmanship undistinguished, and the materials stock. The resources do not have the potential to yield future information (please see Table 2). The consultant was denied access to three properties within the project APE: Mobile Park (VDHR No. 044-5683), Miles Family Cemetery (VDHR No. 044-5698), and Farm and Cemetery, 1750 Joseph Martin Highway (VDHR No. 044-5717).

Table 2. Newly Identified Architectural Resources within Project APE

VDHR Resource Number	Resource Name	Eligibility Recommendation
044-5637	House, 0 Memory Lane	Not Eligible
044-5638	Hawkins-Ramey Cemetery	Not Eligible
044-5639	House, 3996 Soapstone Road	Not Eligible
044-5640	House, 4355 Soapstone Road	Not Eligible
044-5641	House, 49 Ravenswood Lane	Not Eligible
044-5642	House, 4385 Soapstone Road	Not Eligible
044-5643	House, 143 Turfman Drive	Not Eligible
044-5645	House, 105 Red Fox Road	Not Eligible

Table 2. Newly Identified Architectural Resources within Project APE (cont.)

VDHR Resource Number	Resource Name	Eligibility Recommendation
044-5646	House, 2960 Lee Ford Camp Road	Not Eligible
044-5647	House, 3129 Lee Ford Camp Road	Not Eligible
044-5648	House, 165 Walnut Dale Road	Not Eligible
044-5649	House, 130 Glenbrier Drive	Not Eligible
044-5650	House, 0 White House Road	Not Eligible
044-5651	Church-Beale Cemetery	Not Eligible
044-5652	House, 321 White House Road	Not Eligible
044-5653	House, 351 White House Road	Not Eligible
044-5654	House, 521 White House Road	Not Eligible
044-5655	House, 756 White House Road	Not Eligible
044-5656	House, 10464 Greensboro Road	Not Eligible
044-5657	House, 10482 Greensboro Road	Not Eligible
044-5658	House, 10486 Greensboro Road	Not Eligible
044-5659	House, 10514 Greensboro Road	Not Eligible
044-5660	House, 10790 Greensboro Road	Not Eligible
044-5662	House, 10978 Greensboro Road	Not Eligible
044-5663	House, 11000 Greensboro Road	Not Eligible
044-5665	House, 3038 Lee Ford Camp Road	Not Eligible
044-5666	House, 103 Dalton Circle	Not Eligible
044-5670	House, 11793 Greensboro Road	Not Eligible
044-5671	House, 11689 Greensboro Road	Not Eligible

Table 2. Newly Identified Architectural Resources within Project APE (cont.)

VDHR Resource Number	Resource Name	Eligibility Recommendation
044-5672	House, 11387 Greensboro Road	Not Eligible
044-5673	House, 11361 Greensboro Road	Not Eligible
044-5674	House, 0 Greensboro Road	Not Eligible
044-5675	House, 11175 Greensboro Road	Not Eligible
044-5676	House, 0 Greensboro Road	Not Eligible
044-5677	House, 61 Dalton Circle	Not Eligible
044-5678	House, 10731 Greensboro Road	Not Eligible
044-5679	House, 10613 Greensboro Road	Not Eligible
044-5680	House, 58 J.B. Dalton Road	Not Eligible
044-5681	Apartments, 146 J.B. Dalton Road	Not Eligible
044-5682	House, 156 J.B. Dalton Road	Not Eligible
044-5683	Mobile Park, 0 Seebrook Drive	Not Accessible
044-5684	House, 150 Carolina Place	Not Eligible
044-5685	House, 57 J.B. Dalton Road	Not Eligible
044-5686	House, 10441 Greensboro Road	Not Eligible
044-5687	House, 0 Greensboro Road	Not Eligible
044-5688	House, 10293 Greensboro Road	Not Eligible
044-5689	Eastwood Towing, 10151 Greensboro Road	Not Eligible
044-5690	House, 70 Matrimony Creek Road	Not Eligible
044-5691	House, 200 J.B. Dalton Road	Not Eligible
044-5692	House, 232 J.B. Dalton Road	Not Eligible
044-5693	House, 111 Carolina Road	Not Eligible
044-5694	House, 139 J.B. Dalton Road	Not Eligible
044-5695	Redd Family Cemetery	Not Eligible
044-5697	House, Greensboro Road	Not Eligible
044-5698	Miles Family Cemetery	Not Accessible
044-5702	Farm, Preston Farm Road	Not Eligible

Table 2. Newly Identified Architectural Resources within Project APE (cont.)

VDHR Resource Number	Resource Name	Eligibility Recommendation
044-5703	Shed, 106 Winners Circle	Not Eligible
044-5704	Mobile Home/Trailer, 162 Watdil Circle	Not Eligible
044-5705	House, 1420 Joseph Martin Highway	Not Eligible
044-5706	Barn and Shed, 322 Trinity Terrace	Not Eligible
044-5707	House, 43 Oriole Road	Not Eligible
044-5708	House, 23 Oriole Road	Not Eligible
044-5709	House, 1694 Joseph Martin Highway	Not Eligible
044-5710	House, 1718 Joseph Martin Highway	Not Eligible
044-5712	House, 2199 Joseph Martin Highway	Not Eligible
044-5714	Farm, 70 Ravenswood Lane	Not Eligible
044-5715	Farm, 145 Ravenswood Lane	Not Eligible
044-5717	Farm and Cemetery, 1750 Joseph Martin Highway	Inaccessible
044-5718	House, 247 New Light Church Road	Not Eligible
044-5719	House, 119 Rush Drive	Not Eligible
044-5720	House, 2730 Joseph Martin Highway	Not Eligible
044-5721	House, 2959 Joseph Martin Highway	Not Eligible
044-5722	Trailer, 127 Memory Lane	Not Eligible
044-5723	House, 149 Memory Lane	Not Eligible
044-5726	House, 3749 Joseph Martin Highway	Not Eligible
044-5727	House, 3745 Soapstone Road	Not Eligible
044-5729	House and Cemetery, Greensboro Road	Not Eligible
044-5730	House, Soapstone Road	Not Eligible
044-5731	Apartment and Log Cabin, 10025 Greensboro Road	Not Eligible
044-5732	House, Greensboro Road	Not Eligible

Table 2. Newly Identified Architectural Resources within Project APE (cont.)

VDHR Resource Number	Resource Name	Eligibility Recommendation
044-5733	Citgo Station, 10053 Greensboro Road	Not Eligible
044-5734	House, 10060 Greensboro Road	Not Eligible
044-5735	House, 111 Matrimony Creek Road	Not Eligible
044-5736	House, 122 Watdill Circle	Not Eligible
044-5737	House, 1310 Fisher Farm Road	Not Eligible
044-5738	House, 1346 Fisher Farm Road	Not Eligible
044-5739	Church and House; 1358 and 1376 Joseph Martin Highway	Not Eligible
044-5740	House, 1377 Joseph Martin Highway	Not Eligible
044-5741	House, 1390 Fisher Farm Road	Not Eligible
044-5742	House, 1396 Fisher Farm Road	Not Eligible
044-5743	House, 1405 Fisher Farm Road	Not Eligible
044-5744	House, 1414 Fisher Farm Road	Not Eligible
044-5745	House, 1903 Joseph Martin Highway	Not Eligible
044-5746	House, 215 Ravenswood Lane	Not Eligible
044-5747	House, 231 J.B. Dalton road	Not Eligible
044-5748	House, 237 Ebony Road	Not Eligible
044-5749	House, 270 Trinity Terrace	Not Eligible
044-5750	House, 273 Ebony Drive	Not Eligible
044-5751	House, 2826 Joseph Martin Highway	Not Eligible
044-5752	House, 2834 Joseph Martin Highway	Not Eligible
044-5753	House, 291 Ebony Drive	Not Eligible
044-5754	Garage, 300 J.B. Dalton Road	Not Eligible

Table 2. Newly Identified Architectural Resources within Project APE (cont.)

VDHR Resource Number	Resource Name	Eligibility Recommendation
044-5755	House, 3110 Lee Ford Camp Road	Not Eligible
044-5756	House, 313 Ebony Road	Not Eligible
044-5757	House, 321 Ebony Road	Not Eligible
044-5758	House, 339 Trinity Terrace	Not Eligible
044-5759	House, 361 Trinity Terrace	Not Eligible
044-5760	House, 4012 Soapstone Road	Not Eligible
044-5761	House, 4140 Soapstone Road	Not Eligible
044-5762	House, 45 Watdill Circle	Not Eligible
044-5763	House, 47 White House Road	Not Eligible
044-5764	House and Cemetery, 4759 Soapstone Road	Not Eligible
044-5765	House, 4885 Soapstone Road	Not Eligible
044-5766	House, 5907 Soapstone Road	Not Eligible
044-5767	House, 5943 Soapstone Road	Not Eligible
044-5768	House, 62 White House Road	Not Eligible
044-5769	House, 88 Red Fox Road	Not Eligible
044-5770	House, 88 Watdill Circle	Not Eligible
044-5771	House, 1270 Fisher Farm Road	Not Eligible
044-5772	House, 1280 Fisher Farm Road	Not Eligible
044-5774	House, west of William Stone Highway	Not Eligible
044-5775	Barn, south of William Stone Highway	Not Eligible
044-5889	House, 1330 Fisher Farm Road	Not Eligible

Identification of Archaeological Resources

The direct effects APE for the Martinsville Southern Connector consists of a 400-foot wide corridor for Build Alternatives A, B, and C. For the purpose of determining where archaeological survey still needs to be conducted in order to ensure that all archaeological sites eligible for listing on the NRHP and potentially affected by the Martinsville Southern Connector are taken into account, VDOT prepared the technical report, *Phase IA Archaeological Assessment Martinsville Southern Connector Study Henry County, Virginia* June 2019. The report reviews the geographic coverage and findings of previous archaeological survey undertaken by VDOT and others in relation to the Martinsville Southern Connector direct effects APE and describes present land use conditions in order to assess the land's potential to contain intact archaeological remains. Section 6 of the assessment report identifies several areas of the direct effects APE where additional archaeological survey is warranted.

Table 3. Previously Recorded Archaeological Sites

VDHR No.	Resource Name/Time Period	Eligibility Recommendation
44HR0033	Camp/Middle Archaic	Not Evaluated
44HR0044	No Data/Late Woodland	Not Evaluated
44HR0045	No Data/Late Woodland	Not Evaluated
44HR0047	No Data/Late Woodland	Not Evaluated
44HR0048	No Data/Late Woodland	Not Evaluated
44HR0055	Camp/Early to Middle Archaic	Not Evaluated
44HR0160	Dwelling/1800-1899	Not Evaluated
44HR0167	No Data/Unknown Prehistoric	Not Evaluated
44HR0199	Dwelling/1950-1999	Not Eligible
44HR0206	Dwelling/Late 19th to Early 20th Centuries	Not Evaluated
44HR0207	Martin Cemetery/1890-1912	Not Evaluated
44HR0208	Tobacco Barn/Early 20th Century	Not Evaluated
044-0117	Marrowbone Creek Bridge Area/Unknown Prehistoric	Not Evaluated

The VDOT invites the VDHR and Martinsville-Henry County Historical Society to concur with our recommendations by completing the signature block below, and returning the original signature to my attention within 30 days of the receipt of this letter. Please contact Sarah at (804)371-6710, Sarah.Clarke@vdot.virginia.gov, if you have questions about this project.

Sincerely,

Sarah M. Clarke

Sarah M. Clarke
Environmental Program Planner
Cultural Resources

Enclosures

c. Martinsville-Henry County Historic Society

****

The Department of Historic Resources (VDHR) concurs with the following findings of the Virginia Department of Transportation (VDOT):

- Belleview (VDHR No. 044-0002) remains listed on the NRHP;

- Marrowbone (VDHR No. 044-0009), Cemetery (VDHR No. 044-5182), Cemetery (VDHR No. 044-5183), and Watkins Cemetery (VDHR No. 044-5188) remain eligible for the NRHP;

- VDOT's NRHP eligibility determinations for the architectural resources listed in Table 2 of the report, *Martinsville Southern Connector Study Architectural History Survey, Henry County, Virginia,* dated August 2019, prepared by AECOM;

- VDOT's findings that survey within the areas described in Section 6 of the report, *Phase IA Archaeological Assessment Martinsville Southern Connector Study Henry County,* Virginia, dated August 2019, prepared by AECOM for VDOT, are sufficient for completing efforts to identify, at the Phase I level, all archaeological sites within the Martinsville Southern Connector Study direct effects Area of Potential Effects (APE) that may be eligible for the NRHP; *

For VDOT Project No. 0220-044-052, P101; UPC: 110916; VDHR File No.: 2019-0226.

Marc Holma

for Julie V. Langan
Director, Virginia Department of Historic Resources
Virginia State Historic Preservation Officer

7 OCT 2019
Date

* DHR concurs with the recommendation for archaeological survey as described in Section 6 of the Phase IA report; however, when using a probability model DHR Guidelines recommend testing at least 10% of low probability areas in order to confirm the effectiveness of the model.

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
1401 EAST BROAD STREET
RICHMOND, VIRGINIA 23219-2000

Stephen C. Brich, P.E.
COMMISSIONER

September 12, 2019

Virginia King
Martinsville-Henry County Historical Society
29A Jones Street
Martinsville, VA 24112

Route Number: 220
Project Number: 0220-044-052
UPC: 110916
County: Henry County
Project Description: Martinsville Southern Connector
Proposed Action: Consulting Party Review of Cultural Resources Survey

Dear Ms. King:

The Federal Highway Administration (FHWA), in coordination with the Virginia Department of Transportation (VDOT), is preparing an Environmental Impact Statement (EIS) to evaluate potential transportation improvements known as the Martinsville Southern Connector. The EIS is being prepared in accordance with the National Environmental Policy Act of 1969 (NEPA) and will analyze options to develop a limited-access facility between the Route 58/220 By-pass, on the south side of the City of Martinsville, and the North Carolina state line for a distance of approximately seven miles.

The Martinsville-Henry County Historical Society has been identified as a consulting party in the Section 106 process. As such, the VDOT wishes to provide you an opportunity to review and comment on the enclosed reports *Martinsville Southern Connector Study Architectural History Survey Henry County, Virginia* and *Phase IA Archaeological Assessment Martinsville Southern Connector Study Henry County, Virginia.* Enclosed are CD versions of the reports; however, if you prefer a hardcopies please let me know and I will make them available for you. In addition, please find included with this letter, the letter of submittal to the Virginia Department of Historic Resources (DHR) with the VDOT's National Register of Historic Places (NRHP) eligibility recommendations for the resources surveyed during the course of this project.

I would appreciate your response by letter or email, within thirty days of receipt of this letter with any comments or concerns related to the enclosed report and proposed NRHP eligibility recommendations. If you have any questions or would like additional information about the project, please don't hesitate to contact me directly at (804) 371-6710 or by email at Sarah.Clarke@vdot.virginia.gov.

Thank you for your assistance on this project.

Sincerely,

Sarah M. Clarke

Enclosures: CDs- Cultural Resources Assessment Martinsville Southern Connector Study Henry County, Virginia and Cultural Resources Assessment, Martinsville Southern Connector Study Henry County, Virginia.

THREATENED AND ENDANGERED SPECIES CONSULTATION

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
Phone: (804) 693-6694 Fax: (804) 693-9032
http://www.fws.gov/northeast/virginiafield/

In Reply Refer To: October 03, 2019
Consultation Code: 05E2VA00-2020-SLI-0063
Event Code: 05E2VA00-2020-E-00206
Project Name: Route 220 Martinsville Southern Connector Natural Resources Study

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The enclosed species list identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*). Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

The purpose of the Act is to provide a means whereby threatened and endangered species and the ecosystems upon which they depend may be conserved. Under sections 7(a)(1) and 7(a)(2) of the Act and its implementing regulations (50 CFR 402 *et seq.*), Federal agencies are required to utilize their authorities to carry out programs for the conservation of threatened and endangered species and to determine whether projects may affect threatened and endangered species and/or designated critical habitat.

A Biological Assessment is required for construction projects (or other undertakings having similar physical impacts) that are major Federal actions significantly affecting the quality of the human environment as defined in the National Environmental Policy Act (42 U.S.C. 4332(2)(c)). For projects other than major construction activities, the Service suggests that a biological evaluation similar to a Biological Assessment be prepared to determine whether the project may affect listed or proposed species and/or designated or proposed critical habitat. Recommended contents of a Biological Assessment are described at 50 CFR 402.12.

If a Federal agency determines, based on the Biological Assessment or biological evaluation, that listed species and/or designated critical habitat may be affected by the proposed project, the agency is required to consult with the Service pursuant to 50 CFR 402. In addition, the Service recommends that candidate species, proposed species and proposed critical habitat be addressed within the consultation. More information on the regulations and procedures for section 7 consultation, including the role of permit or license applicants, can be found in the "Endangered Species Consultation Handbook" at:

http://www.fws.gov/endangered/esa-library/pdf/TOC-GLOS.PDF

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office.

Attachment(s):

- Official Species List
- USFWS National Wildlife Refuges and Fish Hatcheries

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

Project Summary

Consultation Code: 05E2VA00-2020-SLI-0063

Event Code: 05E2VA00-2020-E-00206

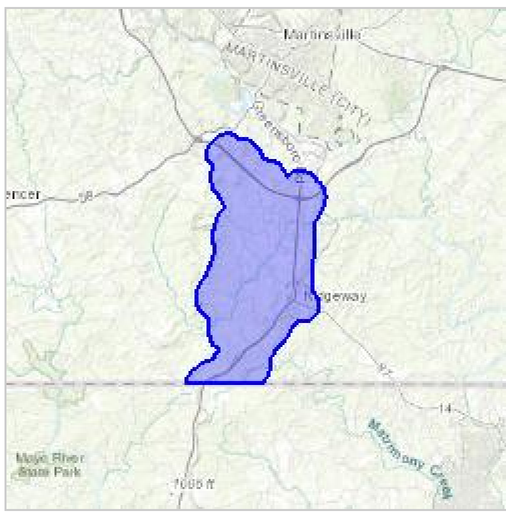
Project Name: Route 220 Martinsville Southern Connector Natural Resources Study

Project Type: TRANSPORTATION

Project Description: The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the Federal Lead Agency, is evaluating potential transportation improvements along the U.S. Route 220 corridor between the North Carolina state line and U.S. Route 58 near the City of Martinsville, Virginia.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.5966933129267N79.8801339340492W



Counties: Rockingham, NC | Henry, VA

Endangered Species Act Species

There is a total of 1 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Mammals

NAME	STATUS
Northern Long-eared Bat *Myotis septentrionalis* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/9045	Threatened

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

USFWS National Wildlife Refuge Lands And Fish Hatcheries

Any activity proposed on lands managed by the National Wildlife Refuge system must undergo a 'Compatibility Determination' conducted by the Refuge. Please contact the individual Refuges to discuss any questions or concerns.

THERE ARE NO REFUGE LANDS OR FISH HATCHERIES WITHIN YOUR PROJECT AREA.

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
Phone: (919) 856-4520 Fax: (919) 856-4556

In Reply Refer To: October 03, 2019
Consultation Code: 04EN2000-2020-SLI-0015
Event Code: 04EN2000-2020-E-00048
Project Name: Route 220 Martinsville Southern Connector Natural Resources Study

Subject: List of threatened and endangered species that may occur in your proposed project location, and/or may be affected by your proposed project

To Whom It May Concern:

The species list generated pursuant to the information you provided identifies threatened, endangered, proposed and candidate species, as well as proposed and final designated critical habitat, that may occur within the boundary of your proposed project and/or may be affected by your proposed project. The species list fulfills the requirements of the U.S. Fish and Wildlife Service (Service) under section 7(c) of the Endangered Species Act (Act) of 1973, as amended (16 U.S.C. 1531 *et seq.*).

New information based on updated surveys, changes in the abundance and distribution of species, changed habitat conditions, or other factors could change this list. Please feel free to contact us if you need more current information or assistance regarding the potential impacts to federally proposed, listed, and candidate species and federally designated and proposed critical habitat. Please note that under 50 CFR 402.12(e) of the regulations implementing section 7 of the Act, the accuracy of this species list should be verified after 90 days. This verification can be completed formally or informally as desired. The Service recommends that verification be completed by visiting the ECOS-IPaC website at regular intervals during project planning and implementation for updates to species lists and information. An updated list may be requested through the ECOS-IPaC system by completing the same process used to receive the enclosed list.

Section 7 of the Act requires that all federal agencies (or their designated non-federal representative), in consultation with the Service, insure that any action federally authorized, funded, or carried out by such agencies is not likely to jeopardize the continued existence of any federally-listed endangered or threatened species. A biological assessment or evaluation may be prepared to fulfill that requirement and in determining whether additional consultation with the Service is necessary. In addition to the federally-protected species list, information on the species' life histories and habitats and information on completing a biological assessment or evaluation and can be found on our web page at http://www.fws.gov/raleigh. Please check the web site often for updated information or changes

If your project contains suitable habitat for any of the federally-listed species known to be present within the county where your project occurs, the proposed action has the potential to adversely affect those species. As such, we recommend that surveys be conducted to determine the species' presence or absence within the project area. The use of North Carolina Natural Heritage program data should not be substituted for actual field surveys.

If you determine that the proposed action may affect (i.e., likely to adversely affect or not likely to adversely affect) a federally-protected species, you should notify this office with your determination, the results of your surveys, survey methodologies, and an analysis of the effects of the action on listed species, including consideration of direct, indirect, and cumulative effects, before conducting any activities that might affect the species. If you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared). However, you should maintain a complete record of the assessment, including steps leading to your determination of effect, the qualified personnel conducting the assessment, habitat conditions, site photographs, and any other related articles.

Please be aware that bald and golden eagles are protected under the Bald and Golden Eagle Protection Act (16 U.S.C. 668 *et seq.*), and projects affecting these species may require development of an eagle conservation plan (http://www.fws.gov/windenergy/eagle_guidance.html). Additionally, wind energy projects should follow the wind energy guidelines (http://www.fws.gov/windenergy/) for minimizing impacts to migratory birds and bats.

Guidance for minimizing impacts to migratory birds for projects including communications towers (e.g., cellular, digital television, radio, and emergency broadcast) can be found at: http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/towers.htm; http://www.towerkill.com; and http://www.fws.gov/migratorybirds/CurrentBirdIssues/Hazards/towers/comtow.html.

Not all Threatened and Endangered Species that occur in North Carolina are subject to section 7 consultation with the U.S Fish and Wildlife Service. Atlantic and shortnose sturgeon, sea turtles,when in the water, and certain marine mammals are under purview of the National Marine Fisheries Service. If your project occurs in marine, estuarine, or coastal river systems you should also contact the National Marine Fisheries Service, http://www.nmfs.noaa.gov/

We appreciate your concern for threatened and endangered species. The Service encourages Federal agencies to include conservation of threatened and endangered species into their project planning to further the purposes of the Act. Please include the Consultation Tracking Number in the header of this letter with any request for consultation or correspondence about your project that you submit to our office. If you have any questions or comments, please contact John Ellis of this office at john_ellis@fws.gov.

Attachment(s):

- Official Species List

Official Species List

This list is provided pursuant to Section 7 of the Endangered Species Act, and fulfills the requirement for Federal agencies to "request of the Secretary of the Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action".

This species list is provided by:

Raleigh Ecological Services Field Office
Post Office Box 33726
Raleigh, NC 27636-3726
(919) 856-4520

This project's location is within the jurisdiction of multiple offices. Expect additional species list documents from the following office, and expect that the species and critical habitats in each document reflect only those that fall in the office's jurisdiction:

Virginia Ecological Services Field Office
6669 Short Lane
Gloucester, VA 23061-4410
(804) 693-6694

Project Summary

Consultation Code: 04EN2000-2020-SLI-0015

Event Code: 04EN2000-2020-E-00048

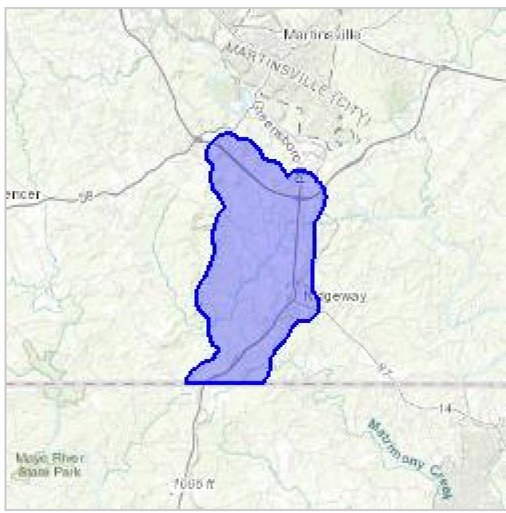
Project Name: Route 220 Martinsville Southern Connector Natural Resources Study

Project Type: TRANSPORTATION

Project Description: The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA) as the Federal Lead Agency, is evaluating potential transportation improvements along the U.S. Route 220 corridor between the North Carolina state line and U.S. Route 58 near the City of Martinsville, Virginia.

Project Location:

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.5966933129267N79.8801339340492W



Counties: Rockingham, NC | Henry, VA

Endangered Species Act Species

There is a total of 3 threatened, endangered, or candidate species on this species list.

Species on this list should be considered in an effects analysis for your project and could include species that exist in another geographic area. For example, certain fish may appear on the species list because a project could affect downstream species.

IPaC does not display listed species or critical habitats under the sole jurisdiction of NOAA Fisheries[1], as USFWS does not have the authority to speak on behalf of NOAA and the Department of Commerce.

See the "Critical habitats" section below for those critical habitats that lie wholly or partially within your project area under this office's jurisdiction. Please contact the designated FWS office if you have questions.

---

1. NOAA Fisheries, also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

Fishes

NAME	STATUS
Roanoke Logperch *Percina rex* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/1134	Endangered

Clams

NAME	STATUS
James Spinymussel *Pleurobema collina* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/2212	Endangered

Flowering Plants

NAME	STATUS
Smooth Coneflower *Echinacea laevigata* No critical habitat has been designated for this species. Species profile: https://ecos.fws.gov/ecp/species/3473	Endangered

Critical habitats

THERE ARE NO CRITICAL HABITATS WITHIN YOUR PROJECT AREA UNDER THIS OFFICE'S JURISDICTION.

Parks, Caleb

From: Aymond, Angel <angel.aymond@vdot.virginia.gov>
Sent: Wednesday, October 2, 2019 7:33 AM
To: Parks, Caleb
Subject: Fwd: Martinsville 220 EIS - black rail

Please add this email to the documentation for coordination on the black rail. Need to add a sentence to the NRTR explaining this new information that became available in fall 2019.

Angel

---------- Forwarded message ---------
From: **Golden, Amy** <amy.golden@vdot.virginia.gov>
Date: Tue, Oct 1, 2019 at 2:21 PM
Subject: Fwd: Martinsville 220 EIS - black rail
To: Angel Aymond <angel.aymond@vdot.virginia.gov>

For the project file.

---------- Forwarded message ---------
From: **Argo, Emily** <emily_argo@fws.gov>
Date: Tue, Oct 1, 2019 at 1:52 PM
Subject: Martinsville 220 EIS - black rail
To: <Amy.Golden@vdot.virginia.gov>
Cc: Troy Andersen <troy_andersen@fws.gov>

Hi Amy,

Based on the location of the subject project and known occurrences of the proposed threatened black rail in Virginia, this project does not intersect potential suitable habitat and will have no effect on the black rail. Should project plans change or if additional information on the distribution of the proposed threatened black rail or critical habitat becomes available, this determination may be reconsidered. If you have any questions, please contact me at (804) 824-2405, or via email at emily_argo@fws.gov.

Emily

--
Emily E. Argo

Fish and Wildlife Biologist
Virginia Field Office
U.S. Fish and Wildlife Service
6669 Short Lane
Gloucester, VA 23061

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Assistant Regional Director-Ecological Services
5600 American Blvd. West
Bloomington, MN 55437-1458
Phone: (612) 713-5350 Fax: (612) 713-5292

In Reply Refer To: December 19, 2019
Consultation Code: 05E2VA00-2020-TA-1148
Consultation Code: 04EN2000-2020-TA-0386
Event Code: 04EN2000-2020-E-00877
Project Name: Martinsville Southern Connector Study

Subject: Verification letter for the 'Martinsville Southern Connector Study' project under the January 5, 2016, Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-eared Bat and Activities Excepted from Take Prohibitions.

Dear Justin Weiser:

The U.S. Fish and Wildlife Service (Service) received on December 19, 2019 your effects determination for the 'Martinsville Southern Connector Study' (the Action) using the northern long-eared bat (*Myotis septentrionalis*) key within the Information for Planning and Consultation (IPaC) system. This IPaC key assists users in determining whether a Federal action is consistent with the activities analyzed in the Service's January 5, 2016, Programmatic Biological Opinion (PBO). The PBO addresses activities excepted from "take"[1] prohibitions applicable to the northern long-eared bat under the Endangered Species Act of 1973 (ESA) (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.).

Based upon your IPaC submission, the Action is consistent with activities analyzed in the PBO. The Action may affect the northern long-eared bat; however, any take that may occur as a result of the Action is not prohibited under the ESA Section 4(d) rule adopted for this species at 50 CFR §17.40(o). Unless the Service advises you within 30 days of the date of this letter that your IPaC-assisted determination was incorrect, this letter verifies that the PBO satisfies and concludes your responsibilities for this Action under ESA Section 7(a)(2) with respect to the northern long-eared bat.

Please report to our office any changes to the information about the Action that you submitted in IPaC, the results of any bat surveys conducted in the Action area, and any dead, injured, or sick northern long-eared bats that are found during Action implementation. If the Action is not completed within one year of the date of this letter, you must update and resubmit the information required in the IPaC key.

This IPaC-assisted determination allows you to rely on the PBO for compliance with ESA Section 7(a)(2) only for the northern long-eared bat. It **does not** apply to the following ESA-protected species that also may occur in the Action area:

- James Spinymussel, *Pleurobema collina* (Endangered)
- Roanoke Logperch, *Percina rex* (Endangered)
- Smooth Coneflower, *Echinacea laevigata* (Endangered)

If the Action may affect other federally listed species besides the northern long-eared bat, a proposed species, and/or designated critical habitat, additional consultation between you and this Service office is required. If the Action may disturb bald or golden eagles, additional coordination with the Service under the Bald and Golden Eagle Protection Act is recommended.

---

[1]Take means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct [ESA Section 3(19)].

Action Description
You provided to IPaC the following name and description for the subject Action.

1. Name

Martinsville Southern Connector Study

2. Description

The following description was provided for the project 'Martinsville Southern Connector Study':

> The Virginia Department of Transportation (VDOT), in coordination with the Federal Highway Administration (FHWA), have initiated the environmental review process for an Environmental Impact Statement
> (EIS) to evaluate transportation improvements along the U. S. Route 220 corridor between the North Carolina state line to the U. S. Route 58 Bypass. The area for study is anticipated to generally encompass a portion of Henry County southeast of the City of Martinsville, roughly following Greensboro Road (U.S. Route 220) and William F. Stone Highway (U.S. Route 58/U.S. Route 220 Bypass).

Approximate location of the project can be viewed in Google Maps: https://www.google.com/maps/place/36.593109583195144N79.87739835869424W

Determination Key Result

This Federal Action may affect the northern long-eared bat in a manner consistent with the description of activities addressed by the Service’s PBO dated January 5, 2016. Any taking that may occur incidental to this Action is not prohibited under the final 4(d) rule at 50 CFR

§17.40(o). Therefore, the PBO satisfies your responsibilities for this Action under ESA Section 7(a)(2) relative to the northern long-eared bat.

Determination Key Description: Northern Long-eared Bat 4(d) Rule

This key was last updated in IPaC on May 15, 2017. Keys are subject to periodic revision.

This key is intended for actions that may affect the threatened northern long-eared bat.

The purpose of the key for Federal actions is to assist determinations as to whether proposed actions are consistent with those analyzed in the Service's PBO dated January 5, 2016.

Federal actions that may cause prohibited take of northern long-eared bats, affect ESA-listed species other than the northern long-eared bat, or affect any designated critical habitat, require ESA Section 7(a)(2) consultation in addition to the use of this key. Federal actions that may affect species proposed for listing or critical habitat proposed for designation may require a conference under ESA Section 7(a)(4).

Determination Key Result

This project may affect the threatened Northern long-eared bat; therefore, consultation with the Service pursuant to Section 7(a)(2) of the Endangered Species Act of 1973 (87 Stat.884, as amended; 16 U.S.C. 1531 et seq.) is required. However, based on the information you provided, this project may rely on the Service's January 5, 2016, *Programmatic Biological Opinion on Final 4(d) Rule for the Northern Long-Eared Bat and Activities Excepted from Take Prohibitions* to fulfill its Section 7(a)(2) consultation obligation.

Qualification Interview

1. Is the action authorized, funded, or being carried out by a Federal agency?

   Yes

2. Have you determined that the proposed action will have "no effect" on the northern long-eared bat? (If you are unsure select "No")

   No

3. Will your activity purposefully **Take** northern long-eared bats?

   No

4. Is the project action area located wholly outside the White-nose Syndrome Zone?

   Automatically answered
   No

5. Have you contacted the appropriate agency to determine if your project is near a known hibernaculum or maternity roost tree?

   Location information for northern long-eared bat hibernacula is generally kept in state Natural Heritage Inventory databases – the availability of this data varies state-by-state. Many states provide online access to their data, either directly by providing maps or by providing the opportunity to make a data request. In some cases, to protect those resources, access to the information may be limited. A web page with links to state Natural Heritage Inventory databases is available at www.fws.gov/midwest/endangered/mammals/nleb/nhisites.html.

   Yes

6. Will the action affect a cave or mine where northern long-eared bats are known to hibernate (i.e., hibernaculum) or could it alter the entrance or the environment (physical or other alteration) of a hibernaculum?

   No

7. Will the action involve Tree Removal?

   Yes

8. Will the action only remove hazardous trees for the protection of human life or property?

   No

9. Will the action remove trees within 0.25 miles of a known northern long-eared bat hibernaculum at any time of year?

   No

10. Will the action remove a known occupied northern long-eared bat maternity roost tree or any trees within 150 feet of a known occupied maternity roost tree from June 1 through July 31?

    No

Project Questionnaire

If the project includes forest conversion, report the appropriate acreages below. Otherwise, type ‘0’ in questions 1-3.

1. Estimated total acres of forest conversion:

318

2. If known, estimated acres of forest conversion from April 1 to October 31

0

3. If known, estimated acres of forest conversion from June 1 to July 31

0

If the project includes timber harvest, report the appropriate acreages below. Otherwise, type ‘0’ in questions 4-6.

4. Estimated total acres of timber harvest

0

5. If known, estimated acres of timber harvest from April 1 to October 31

0

6. If known, estimated acres of timber harvest from June 1 to July 31

0

If the project includes prescribed fire, report the appropriate acreages below. Otherwise, type ‘0’ in questions 7-9.

7. Estimated total acres of prescribed fire

0

8. If known, estimated acres of prescribed fire from April 1 to October 31

0

9. If known, estimated acres of prescribed fire from June 1 to July 31

0

If the project includes new wind turbines, report the megawatts of wind capacity below. Otherwise, type ‘0’ in question 10.

10. What is the estimated wind capacity (in megawatts) of the new turbine(s)?

0

Matthew J. Strickler
Secretary of Natural Resources

Clyde E. Cristman
Director

Rochelle Altholz
Deputy Director of Administration and Finance

Russell W. Baxter
Deputy Director of Dam Safety & Floodplain Management and Soil & Water Conservation

Thomas L. Smith
Deputy Director of Operations

COMMONWEALTH *of* VIRGINIA

DEPARTMENT OF CONSERVATION AND RECREATION

MEMORANDUM

DATE: April 29, 2019

TO: Angel Aymond, VDOT

FROM: Roberta Rhur, Environmental Impact Review Coordinator

SUBJECT: VDOT 19-014, Martinsville Southern Connector Study, Route 220 EIS

Division of Natural Heritage

The Department of Conservation and Recreation (DCR) has searched its Biotics Data System for occurrences of natural heritage resources from the area outlined on the submitted map. Natural heritage resources are defined as the habitat of rare, threatened, or endangered plant and animal species, unique or exemplary natural communities, and significant geologic formations.

Biotics documents the presence of natural heritage resources within two miles of the project area. However, due to the scope of the activity and the distance to the resources, we do not anticipate that this project will adversely impact these natural heritage resources.

There are no State Natural Area Preserves under DCR's jurisdiction in the project vicinity.

Many invasive plant species are adapted to take advantage of soil disturbances and poor soil conditions. These adaptations are part of what enable certain species to be invasive. Non-native invasive plants are found through Virginia. Therefore, the potential exists for some VDOT projects to further the establishment of invasive species. To minimize the potential for invasive species infestation, projects should be conducted to minimize the area of disturbance, and disturbed sites should be revegetated with desirable species at the earliest opportunity following disturbance. Equally as important, species used for revegetation should not include the highly invasive species that have traditionally been used for revegetating disturbed sites. We recommend VDOT avoid using crown vetch, tall fescue, and autumn olive if at all possible.

For more information on invasive alien plants and native plants, see the DCR-Division of Natural Heritage website http://www.dcr.virginia.gov/natural-heritage/invspinfo.shtml. For sources of native plant material, see the Virginia Native Plant Society's website (http://vnps.org) or the U.S. Fish and Wildlife Service nursery list for Virginia (http://www.fws.gov/ChesapeakeBay/BayScapes/bsresources/bs-nurseries.html).

Under a Memorandum of Agreement established between the Virginia Department of Agriculture and Consumer Services (VDACS) and the DCR, DCR represents VDACS in comments regarding potential impacts on state-listed threatened and endangered plant and insect species. The current activity will not affect any documented state-listed plants or insects.

New and updated information is continually added to Biotics. Please re-submit project information and map for an update on this natural heritage information if the scope of the project changes and/or six months has passed before it is utilized.

All VDOT projects on state-owned lands must comply with the Virginia Erosion & Sediment Control (ESC) Law and Regulations, the Virginia Stormwater Management (SWM) Law and Regulations, the most current version of the DCR approved VDOT Annual ESC and SWM Specifications and Standards, and the project-specific ESC and SWM plans. [Reference: VESCL §10.1-560, §10.1-564; VESCR §4VAC50-30 et al; VSWML §10.1-603 et al; VSWMR §4VAC-3-20 et al].

The VDGIF maintains a database of wildlife locations, including threatened and endangered species, trout streams, and anadromous fish waters that may contain information not documented in this letter. Their database may be accessed from http://vafwis.org/fwis, or contact Ernie Aschenbach at 804-367-2733 or Ernie.Aschenbach@dgif.virginia.gov. According to the information currently in our files, the Smith River, which has been designated by the Virginia Department of Game and Inland Fisheries (VDGIF) as a "Threatened and Endangered Species Water" for the Roanoke logperch is within 2 miles of the project area. Therefore, DCR recommends coordination with the U.S. Fish and Wildlife Service (USFWS) and Virginia's regulatory authority for the management and protection of this species, the VDGIF, to ensure compliance with protected species legislation.

The remaining DCR divisions have no comments regarding the scope of this project. Thank you for the opportunity to comment.

Cc: Ernie Aschenbach, VDGIF
Troy Andersen, USFWS

Parks, Caleb

From: Aymond, Angel <angel.aymond@vdot.virginia.gov>
Sent: Friday, October 4, 2019 2:25 PM
To: Parks, Caleb
Subject: Fwd: FW: Review for mussels: Rt. 220 Martinsville connector study, Henry Co. VA
Attachments: WilliamsEtAl_UpdatedMusselTaxonomy_FMBC_Vol20-2_2017October.pdf

As discussed.

From: Brian Watson <brian.watson@dgif.virginia.gov>
Sent: Monday, April 1, 2019 4:09 PM
To: Susan Alexander <susan.alexander@vdot.virginia.gov>
Cc: Amy Golden <amy.golden@vdot.virginia.gov>
Subject: RE: Review for mussels: Rt. 220 Martinsville connector study, Henry Co. VA

Susan,

Since JSM was not known from the Dan River watershed until 2001 and Marrowbone Creek is in the adjacent subwatershed, DGIF would not rule out JSM as being a possibility. Smith River models as potential habitat for JSM as do portions of Leatherwood Creek, which is a tributary on the east side of Smith River and the next major tributary downstream of Marrowbone Creek. Other possibilities could be Green Floater and Atlantic Pigtoe since they have turned up in the Dan River, which were new records for Atlantic pigtoe, and the Smith River and portions of Leatherwood Creek model as potential habitat for Atlantic Pigtoe.

Parvaspina is the genus for collina, no more Pleurobema. Official taxonomic name changes came out in October 2017, paper attached.

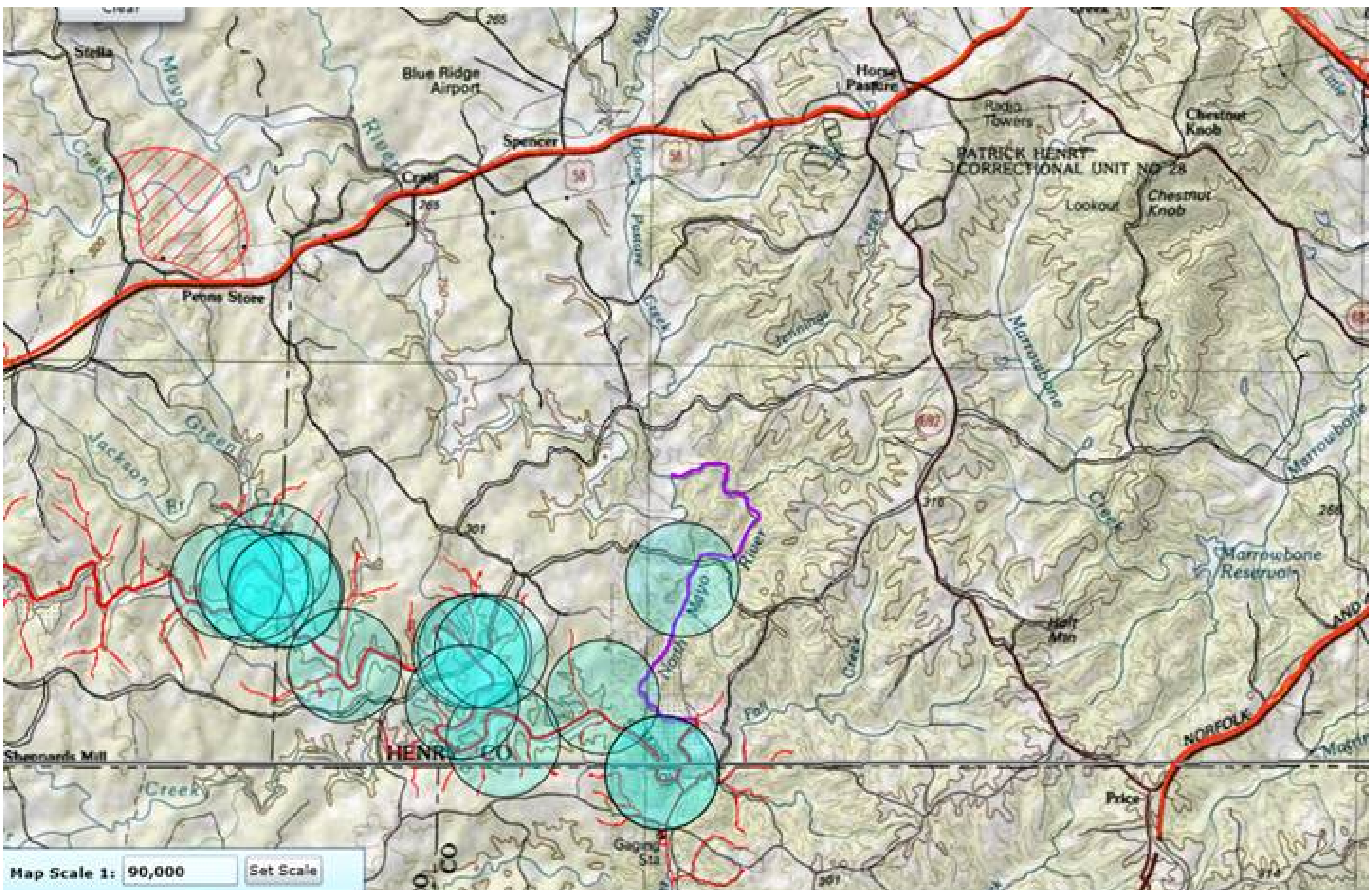
Brian

From: Alexander, Susan <susan.alexander@vdot.virginia.gov>
Sent: Monday, April 1, 2019 3:57 PM
To: Brian Watson <brian.watson@dgif.virginia.gov>
Cc: Amy Golden <amy.golden@vdot.virginia.gov>
Subject: RE: Review for mussels: Rt. 220 Martinsville connector study, Henry Co. VA

Brian,

Just a note… Marrowbone Creek is a tributary to the Smith River, which is in the Roanoke drainage. The Mayo River system appears to be on the other side of the ridge (Rt. 692). We are coordinating with Paul Angermeier regarding habitat assessments for the Roanoke logperch, as well as Orangefin madtom. I had planned to contact Dr. Neves about mussel assessments or surveys along Marrowbone Creek – to ensure all is clear in the event instream work is necessary (i.e. cofferdams or to construct bridge abutments below ordinary high water). If you have any recommendations (I think we can exclude JSM), please let me/us know. Thanks again.

PS: the red/blue circles below are the collection records for JSM (*Parvaspina collina* …not familiar with that genus; is that the NC species). Dates range in 2002 and 2012.



OBSERVATION_DATE	DESCRIPTION	SOURCE_DATABASE_ID	BOVA	GENUS	SPECIES	SUBSPECIES
5/29/2002 12:00:00 AM	VDGIF Scientific Collections, TE, and Salvage permit data		060017	Parvaspina	collina	
5/29/2002 12:00:00 AM	VDGIF Scientific Collections, TE, and Salvage permit data		060017	Parvaspina	collina	
6/7/2012 12:00:00 AM	VDGIF Scientific Collections, TE, and Salvage permit data from application		060017	Parvaspina	collina	
6/27/2005 12:00:00 AM	VDGIF Scientific Collections, TE, and Salvage permit data		010127	Noturus	gilberti	

Record: << < 0 > >> Records (0 out of 16 Selected) Options...

Susan

From: Brian Watson <brian.watson@dgif.virginia.gov>
Sent: Monday, April 1, 2019 2:57 PM
To: Susan Alexander <susan.alexander@vdot.virginia.gov>
Cc: Amy Golden <amy.golden@vdot.virginia.gov>
Subject: RE: Review for mussels: Rt. 220 Martinsville connector study, Henry Co. VA

Susan,

Checking the survey records, that area is kind of an unknown. I am showing no positive or null records Marrowbone Creek and just a handful of survey records in streams nearby like Leatherwood Creek and Matrimony Creek. Given the proximity to JSM in the South Mayo, DGIF would likely recommend abbreviated surveys in Marrowbone Creek if there are instream impacts. Little Marrowbone Creek likely would not need surveys unless something turned up in Marrowbone Creek. Any unnamed tributaries smaller than Little Marrowbone Creek, DGIF likely would not recommend surveys and photos of the sites would probably suffice for the review. Little Marrowbone might suffice using photos as well.

Brian

Brian T. Watson

Aquatic Resources Biologist/State Malacologist

P 434.525-7522, x114 / M 434.941.5990

Virginia Department of Game & Inland Fisheries

CONSERVE. CONNECT. PROTECT.

A 1132 Thomas Jefferson Road, Forest, VA 24551

www.dgif.virginia.gov

From: Alexander, Susan <susan.alexander@vdot.virginia.gov>
Sent: Wednesday, February 20, 2019 3:53 PM
To: Brian Watson <brian.watson@dgif.virginia.gov>
Cc: Amy Golden <amy.golden@vdot.virginia.gov>
Subject: Review for mussels: Rt. 220 Martinsville connector study, Henry Co. VA

Brian,

We are currently working on the NEPA document that proposes new alignment alternatives of Route 220 that will connect Rt. 58 with Rt. 220 at the Virginia/North Carolina Stateline, (Rt. 220 Martinsville Southern Connector Study) . The southernmost end of the new route begins off the existing Rt. 220, just southeast of the Marrowbone Reservoir in Henry County, VA. The northern terminus will be at Rt. 58, south of Martinsville, VA (near Little Marrowbone Creek). At this time, all alternatives are being considered (see attached map), and the final decision will be determined in mid-March. It is likely, however, that options 4C, 4B or 4A will be in the final analysis for the new route. The eastern routes will potentially be eliminated to avoid the Smith River and protected natural resources.

We are reviewing the T&E species that may be associated with the project. There are no collections records of T&E mussels or fish along the immediate alignments west of Rt. 220 (options 4C, 4B, 4A). The streams that are of concern include: Marrowbone Creek, Little Marrowbone Creek, and tributaries in area (unnamed). In efforts to avoid or minimized potential impacts to protected natural resources, we would appreciate your input regarding protected mussels that may be in this area . We would greatly appreciate any information you may have on occurrences, or your thoughts on whether a habitat assessments should be performed. From what we understand, the final road crossings will span many/most of the streams.

FYI: the maps attached are drafts and are not to scale. These are for reference only. The alignments are approximate.

Please let me know if you have questions or need additional information. Thank you for your time and consideration regarding protected mussels in this region of the state.

Susan

--

Freshwater Mollusk Biology and Conservation 20:33–58, 2017

REGULAR ARTICLE

A REVISED LIST OF THE FRESHWATER MUSSELS (MOLLUSCA: BIVALVIA: UNIONIDA) OF THE UNITED STATES AND CANADA

James D. Williams[1]*, Arthur E. Bogan[2], Robert S. Butler[3,4], Kevin S. Cummings[5], Jeffrey T. Garner[6], John L. Harris[7], Nathan A. Johnson[8], and G. Thomas Watters[9]

[1] *Florida Museum of Natural History, Museum Road and Newell Drive, Gainesville, FL 32611 USA*
[2] *North Carolina Museum of Natural Sciences, MSC 1626, Raleigh, NC 27699 USA*
[3] *U.S. Fish and Wildlife Service, 212 Mills Gap Road, Asheville, NC 28803 USA*
[4] *Retired.*
[5] *Illinois Natural History Survey, 607 East Peabody Drive, Champaign, IL 61820 USA*
[6] *Alabama Division of Wildlife and Freshwater Fisheries, 350 County Road 275, Florence, AL 35633 USA*
[7] *Department of Biological Sciences, Arkansas State University, State University, AR 71753 USA*
[8] *U.S. Geological Survey, Wetland and Aquatic Research Center, 7920 NW 71st Street, Gainesville, FL 32653 USA*
[9] *Museum of Biological Diversity, The Ohio State University, 1315 Kinnear Road, Columbus, OH 43212 USA*

ABSTRACT

We present a revised list of freshwater mussels (order Unionida, families Margaritiferidae and Unionidae) of the United States and Canada, incorporating changes in nomenclature and systematic taxonomy since publication of the most recent checklist in 1998. We recognize a total of 298 species in 55 genera in the families Margaritiferidae (one genus, five species) and Unionidae (54 genera, 293 species). We propose one change in the Margaritiferidae: the placement of the formerly monotypic genus *Cumberlandia* in the synonymy of *Margaritifera*. In the Unionidae, we recognize three new genera, elevate four genera from synonymy, and place three previously recognized genera in synonymy. We recognize for the first time two species (one native and one nonindigenous) in the Asian genus *Sinanodonta* as occurring in North America. We recognize four new species and one subspecies and elevate 21 species from synonymy. We elevate 10 subspecies to species status and no longer recognize four subspecies. We change common names for five taxa, correct spelling for eight species, and correct the date of publication of original descriptions for four species.

KEY WORDS: Unionidae, Margaritiferidae, taxonomy, systematics, nomenclature, mussel scientific names, mussel common names

INTRODUCTION

During the past 50 yr, there has been considerable interest in freshwater mussels (order Unionida) in the United States and Canada. Much of this interest was brought about by passage of the U.S. Endangered Species Acts of 1966, 1969, and 1973 and the Canadian Species at Risk Act of 2002. These legislative actions and the environmental movement that accompanied them focused conservation attention on all animals and plants, as well as their habitats. This in turn led

*Corresponding Author: fishwilliams@gmail.com

to assessment of species conservation status and the development of faunal lists for many states and provinces. The task of developing species lists was difficult for most invertebrates, including mussels, because so little attention had been given to the study of their biology, ecology, and systematics. In 1970, only six U.S. states had recent lists or books covering their mussel fauna. The first modern attempt to provide a comprehensive list of freshwater mussels of North America was published by Burch (1973, 1975).

The first comprehensive list of freshwater mussels of the United States and Canada was compiled in Turgeon et al. (1988) and revised a decade later (Turgeon et al. 1998). Williams et al. (1993) was another important resource during this period; although mainly an assessment of species conservation status, this paper also provided a comprehensive and widely used species list similar to those of Turgeon et al. (1988, 1998). These lists standardized and provided taxonomic stability to mussel common and scientific names to an extent that was previously unavailable. However, systematic taxonomy of mussels was poorly known at that time, and classifications at all taxonomic levels were based largely on concepts from the early 1900s.

Since publication of Turgeon et al. (1988, 1998) and Williams et al. (1993), many studies have refined our understanding of mussel systematic taxonomy. Several major publications have addressed systematic relationships within the class Bivalvia, including the order Unionida (Bieler et al. 2010; Carter et al. 2011; Bolotov et al. 2016; Araujo et al. 2017; Combosch et al. 2017). Major studies specific to the Unionida include Graf and Ó Foighil (2000), Hoeh et al. (2001, 2002, 2009), Roe and Hoeh (2003), Campbell et al. (2005), Walker et al. (2006), Graf and Cummings (2007, 2017), Cummings and Graf (2010), and Campbell and Lydeard (2012a, 2012b). In addition, many studies have examined systematic relationships at lower taxonomic levels (e.g., Serb et al. 2003; Jones et al. 2006; Lane et al. 2016). Together, this body of work depicts a view of mussel taxonomy that differs substantially from that of previous lists of the North American fauna.

We present a revised classification and list of the freshwater mussels of the United States and Canada (Tables 1 and 2). The primary purpose of this revision is to provide in a single resource a comprehensive list and taxonomic classification that reflects recent refinement of mussel systematics.

METHODS

We used as a starting point the list of Turgeon et al. (1998). We revised this list and its taxonomic classification based on a review of peer-reviewed mussel taxonomic and nomenclatural literature produced since 1998, unpublished research by the authors, and discussions with other experts on mussel systematics. We also corrected the spelling of specific epithets and publication dates of original descriptions based on the International Code of Zoological Nomenclature (http://www.iczn.org/iczn/index.jsp). Species mentioned in the text, but not included in Table 2, have author and date of publication following the name. Author and date of publication for all other species are given in Table 2.

Mussel common names follow Turgeon et al. (1998) with minor exceptions, but they are capitalized as is now the practice for many other animal groups (e.g., birds, reptiles, amphibians, fishes). Capitalization of common names helps avoid confusion by identifying standardized common names. For example, reference to a "fragile papershell" could apply to several thin-shelled species, but the capitalized "Fragile Papershell" is unambiguously recognized as the common name for *Leptodea fragilis*. We note and explain other instances where we changed common names from those of Turgeon et al. (1998) or where recognition of previously unrecognized species necessitated creation of a new common name.

We provide a rationale for and discussion of all taxonomic changes in the following accounts for each family and genus and in Table 2. There is a degree of uncertainty and subjectivity in our revised list that is unavoidable given our still imperfect understanding of mussel systematics. We attempted to reconcile divergent views regarding mussel systematics based on our assessment of the strength of evidence for these views. In cases where evidence did not allow reconciliation, we attempted to provide a plausible conclusion based on our professional judgment and experience; these conclusions were based on consensus among the authors to the extent possible.

Subspecies is a taxonomic category applied to populations that are morphologically distinct and geographically separated but that exhibit intergradation in contact zones (Mayr et al. 1953; Gilbert 1961). We evaluated morphological and molecular evidence relating to the status of subspecies recognized by Turgeon et al. (1998) and subsequent workers (Jones and Neves 2010). In most cases, recent evidence did not support recognition of subspecies but supported either subsuming subspecies under the nominal species or elevating subspecies to species status; we discuss this evidence for each case. However, strong evidence with which to evaluate their status was lacking for several, mostly extinct, subspecies (see *Epioblasma*). The designation of subspecies versus species is arbitrary and inconsistent for many animal groups (Huang and Knowles 2016), and this has historically been the case for mussels (e.g., Ortmann 1918, 1920). For subspecies that lacked strong evidence for synonymization or elevation, we recognize all as species to provide more consistent null hypotheses regarding potential diversity in these groups.

This work has been registered with ZooBank and a copy has been archived at Zenodo.org.

RESULTS

Freshwater bivalve higher classification continues to evolve as more data are generated and new techniques are developed. Fossil and modern bivalve higher classification has

Table 1. Higher classification of the Unionoidea present in the United States and Canada.

- CLASS Bivalvia Linnaeus, 1758
  - INFRACLASS Heteroconchia Hertwig, 1895
    - COHORT Uniomorphi Gray, 1854 [=Paleoheterodonta]
      - ORDER Unionida Gray, 1854
        - SUPERFAMILY Unionoidea Rafinesque, 1820
- MARGARITIFERIDAE Henderson, 1929
      - *Margaritifera* Schumacher, 1816
- UNIONIDAE Rafinesque, 1820
  - ANODONTINAE Rafinesque, 1820
    - Anodontini Rafinesque, 1820
      - *Alasmidonta* Say, 1818
      - *Anodonta* Lamarck, 1799
      - *Anodontoides* Simpson in Baker, 1898
      - *Arcidens* Simpson, 1900
      - *Lasmigona* Rafinesque, 1831
      - *Pegias* Simpson, 1900
      - *Pyganodon* Crosse and Fischer, 1894
      - *Simpsonaias* Frierson, 1914
      - *Strophitus* Rafinesque, 1820
      - *Utterbackia* Baker, 1927
      - *Utterbackiana* Frierson, 1927
    - Cristariini Lopes-Lima, Bogan, and Froufe, 2017
      - *Sinanodonta* Modell, 1945
  - GONIDEINAE Ortmann, 1916
    - Gonideini Ortmann, 1916
      - *Gonidea* Conrad, 1857
  - AMBLEMINAE Rafinesque, 1820
    - Amblemini Rafinesque, 1820
      - *Amblema* Rafinesque, 1820
    - Lampsilini Ihering, 1901
      - *Actinonaias* Crosse and Fischer, 1894
      - *Cyprogenia* Agassiz, 1852
      - *Cyrtonaias* Crosse and Fischer, 1894
      - *Dromus* Simpson, 1900
      - *Ellipsaria* Rafinesque, 1820
      - *Epioblasma* Rafinesque, 1831
      - *Glebula* Conrad, 1853
      - *Hamiota* Roe and Hartfield, 2005
      - *Lampsilis* Rafinesque, 1820
      - *Lemiox* Rafinesque, 1831
      - *Leptodea* Rafinesque, 1820
      - *Ligumia* Swainson, 1840
      - *Medionidus* Simpson, 1900
      - *Obliquaria* Rafinesque, 1820
      - *Obovaria* Rafinesque, 1819
      - *Plectomerus* Conrad, 1853
      - *Potamilus* Rafinesque, 1818
      - *Ptychobranchus* Simpson, 1900
      - *Toxolasma* Rafinesque, 1831
      - *Truncilla* Rafinesque, 1819
      - *Venustaconcha* Frierson, 1927
      - *Villosa* Frierson, 1927

Table 1, continued.

    - Pleurobemini Hannibal, 1912
      - *Elliptio* Rafinesque, 1819
      - *Elliptoideus* Frierson, 1927
      - *Eurynia* Rafinesque, 1820
      - *Fusconaia* Simpson, 1900
      - *Hemistena* Rafinesque, 1820
      - *Parvaspina* Perkins, Gangloff, and Johnson, 2017
      - *Plethobasus* Simpson, 1900
      - *Pleurobema* Rafinesque, 1819
      - *Pleuronaia* Frierson, 1927
    - Quadrulini Ihering, 1901
      - *Cyclonaias* Pilsbry in Ortmann and Walker, 1922
      - *Megalonaias* Utterback, 1915
      - *Quadrula* Rafinesque, 1820
      - *Theliderma* Swainson, 1840
      - *Tritogonia* Agassiz, 1852
      - *Uniomerus* Conrad, 1853
  - AMBLEMINAE (*incertae sedis*)
      - *Disconaias* Crosse and Fischer, 1894
      - *Popenaias* Frierson, 1927
      - *Reginaia* Campbell and Lydeard, 2012

recently been summarized by Carter et al. (2011), with standardized endings for higher taxa within Bivalvia. Recent evidence supports the order Unionida as a monophyletic clade (Combosch et al. 2017). There have been two recent assessments of the taxonomy for Margaritiferidae (Bolotov et al. 2016; Araujo et al. 2017). Higher level relationships within the Unionidae have recently been reviewed by Lopes-Lima et al. (2017). Based on these publications, we provide our assessment of higher classification of the Unionida and its position in the class Bivalvia (Table 1).

There is general agreement on the three subfamily divisions within the Unionidae in North America and seven subfamilies worldwide, but there remains some uncertainty regarding classification at lower levels. We adopted a subfamily-, tribe-, and generic-level classification for the United States and Canada based on recent phylogenetic research (Table 1). We recognize the Anodontinae as a subfamily with two tribes in the United States and Canada. We recognize the subfamily Gonideinae, containing the genus *Gonidea*. We recognize the subfamily Ambleminae as consisting of four tribes: Amblemini, Lampsilini, Pleurobemini, and Quadrulini. The placement of many genera within tribes in the Ambleminae is well supported and consistent among studies, but the placement of others is less certain and varies among studies (e.g., *Plectomerus*, Campbell et al. 2005). The Mexican and Central American genera *Disconaias* and *Popenaias* and North American *Reginaia* lack sufficient phylogenetic information to be confidently assigned to a classification, and we placed them in Ambleminae incertae sedis (Table 1).

Our revised list includes many taxonomic changes at the

Table 2. List of Margaritiferidae and Unionidae of the United States and Canada. Currently recognized taxa are bolded. Taxa preceded by an asterisk and not bolded appeared in Turgeon et al. (1998) but are no longer recognized or reassigned to other genera.

Scientific Name	Common Name	Changes in Scientific and Common Names
MARGARITIFERIDAE Henderson, 1929		
*_Cumberlandia_ Ortmann, 1912		Synonym of _Margaritifera_
*_Cumberlandia monodonta_ (Say, 1829)	Spectaclecase	Reassigned to _Margaritifera_
Margaritifera Schumacher, 1816		
Margaritifera falcata (Gould, 1850)	Western Pearlshell	
Margaritifera hembeli (Conrad, 1838)	Louisiana Pearlshell	
Margaritifera margaritifera (Linnaeus, 1758)	Eastern Pearlshell	
Margaritifera marrianae Johnson, 1983	Alabama Pearlshell	
Margaritifera monodonta (Say, 1829)	Spectaclecase	Reassigned from _Cumberlandia_
UNIONIDAE Rafinesque, 1820		
Actinonaias Crosse and Fischer, 1894		
Actinonaias ligamentina (Lamarck, 1819)	Mucket	
Actinonaias pectorosa (Conrad, 1834)	Pheasantshell	
Alasmidonta Say, 1818		
Alasmidonta arcula (Lea, 1838)	Altamaha Arcmussel	
Alasmidonta atropurpurea (Rafinesque, 1831)	Cumberland Elktoe	
Alasmidonta heterodon (Lea, 1829)	Dwarf Wedgemussel	Publication date corrected
Alasmidonta marginata Say, 1818	Elktoe	
Alasmidonta mccordi Athearn, 1964	Coosa Elktoe	
Alasmidonta raveneliana (Lea, 1834)	Appalachian Elktoe	
Alasmidonta robusta Clarke, 1981	Carolina Elktoe	
Alasmidonta triangulata (Lea, 1858)	Southern Elktoe	
Alasmidonta undulata (Say, 1817)	Triangle Floater	
Alasmidonta varicosa (Lamarck, 1819)	Brook Floater	
Alasmidonta viridis (Rafinesque, 1820)	Slippershell Mussel	
Alasmidonta wrightiana (Walker, 1901)	Ochlockonee Arcmussel	
Amblema Rafinesque, 1820		
Amblema elliottii (Lea, 1856)	Coosa Fiveridge	
Amblema neislerii (Lea, 1858)	Fat Threeridge	
Amblema plicata (Say, 1817)	Threeridge	
Anodonta Lamarck, 1799		
*_Anodonta beringiana_ Middendorff, 1851	Yukon Floater	Reassigned to _Sinanodonta_
Anodonta californiensis Lea, 1852	California Floater	
*_Anodonta couperiana_ Lea, 1840	Barrel Floater	Reassigned to _Utterbackiana_
*_Anodonta dejecta_ Lewis, 1875	Woebegone Floater	Synonym of _Anodonta californiensis_
*_Anodonta heardi_ Gordon and Hoeh, 1995	Apalachicola Floater	Reassigned to _Utterbackiana_
*_Anodonta implicata_ Say, 1829	Alewife Floater	Reassigned to _Utterbackiana_
Anodonta kennerlyi Lea, 1860	Western Floater	
Anodonta nuttalliana Lea, 1838	Winged Floater	
Anodonta oregonensis Lea, 1838	Oregon Floater	
*_Anodonta suborbiculata_ Say, 1831	Flat Floater	Reassigned to _Utterbackiana_
Anodontoides Simpson in Baker, 1898		
Anodontoides denigrata (Lea, 1852)	Cumberland Papershell	Elevated from synonymy
Anodontoides ferussacianus (Lea, 1834)	Cylindrical Papershell	
Anodontoides radiatus (Conrad, 1834)	Rayed Creekshell	
Arcidens Simpson, 1900		
Arcidens confragosus (Say, 1829)	Rock Pocketbook	
Arcidens wheeleri (Ortmann and Walker, 1912)	Ouachita Rock Pocketbook	Reassigned from _Arkansia_
*_Arkansia_ Ortmann and Walker, 1912		Synonym of _Arcidens_
*_Arkansia wheeleri_ Ortmann and Walker, 1912	Ouachita Rock Pocketbook	Reassigned to _Arcidens_

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
Cyclonaias **Pilsbry in Ortmann and Walker, 1922**		
Cyclonaias archeri **(Frierson, 1905)**	Tallapoosa Orb	Elevated from synonymy
Cyclonaias asperata **(Lea, 1861)**	Alabama Orb	Reassigned from *Quadrula*
Cyclonaias aurea **(Lea, 1859)**	Golden Orb	Reassigned from *Quadrula*
Cyclonaias houstonensis **(Lea, 1859)**	Smooth Pimpleback	Reassigned from *Quadrula*
Cyclonaias infucata **(Conrad, 1834)**	Sculptured Pigtoe	Reassigned from *Quincuncina*
Cyclonaias kieneriana **(Lea, 1852)**	Coosa Orb	Elevated from synonymy
Cyclonaias kleiniana **(Lea, 1852)**	Florida Mapleleaf	Elevated from synonymy
Cyclonaias mortoni **(Conrad, 1835)**	Western Pimpleback	Species elevated from subspecies; reassigned from *Quadrula*
Cyclonaias nodulata **(Rafinesque, 1820)**	Wartyback	Reassigned from *Quadrula*
Cyclonaias petrina **(Gould, 1855)**	Texas Pimpleback	Reassigned from *Quadrula*
Cyclonaias pustulosa **(Lea, 1831)**	Pimpleback	Reassigned from *Quadrula*
Cyclonaias refulgens **(Lea, 1868)**	Purple Pimpleback	Reassigned from *Quadrula*
Cyclonaias succissa **(Lea, 1852)**	Purple Pigtoe	Reassigned from *Fusconaia*
Cyclonaias tuberculata **(Rafinesque, 1820)**	Purple Wartyback	
Cyprogenia **Agassiz, 1852**		
Cyprogenia aberti **(Conrad, 1850)**	Western Fanshell	
Cyprogenia stegaria **(Rafinesque, 1820)**	Fanshell	
Cyrtonaias **Crosse and Fischer, 1894**		
Cyrtonaias tampicoensis **(Lea, 1838)**	Tampico Pearlymussel	
Disconaias **Crosse and Fischer, 1894**		
Disconaias fimbriata **(Frierson, 1907)**	Fringed Mucket	Elevated from synonymy
**Disconaias salinasensis* (Simpson, 1908)	Salina Mucket	Synonym of *Disconaias fimbriata*
Dromus **Simpson, 1900**		
Dromus dromas **(Lea, 1834)**	Dromedary Pearlymussel	
Ellipsaria **Rafinesque, 1820**		
Ellipsaria lineolata **(Rafinesque, 1820)**	Butterfly	
Elliptio **Rafinesque, 1819**		
Elliptio ahenea **(Lea, 1843)**	Southern Lance	
Elliptio angustata **(Lea, 1831)**	Carolina Lance	
Elliptio arca **(Conrad, 1834)**	Alabama Spike	
Elliptio arctata **(Conrad, 1834)**	Delicate Spike	
**Elliptio buckleyi* (Lea, 1843)	Florida Shiny Spike	Synonym of *Elliptio jayensis*
Elliptio chipolaensis **(Walker, 1905)**	Chipola Slabshell	
Elliptio cistellaeformis **(Lea, 1863)**	Box Spike	
Elliptio complanata **(Lightfoot, 1786)**	Eastern Elliptio	
Elliptio congaraea **(Lea, 1831)**	Carolina Slabshell	
Elliptio crassidens **(Lamarck, 1819)**	Elephantear	
Elliptio dariensis **(Lea, 1842)**	Georgia Elephantear	
**Elliptio dilatata* (Rafinesque, 1820)	Spike	Reassigned to *Eurynia*
Elliptio downiei **(Lea, 1858)**	Satilla Elephantear	
**Elliptio errans* (Lea, 1856)	Oval Elliptio	Synonym of *Elliptio icterina*; publication date corrected
Elliptio fisheriana **(Lea, 1838)**	Northern Lance	
Elliptio folliculata **(Lea, 1838)**	Pod Lance	
Elliptio fraterna **(Lea, 1852)**	Brother Spike	
Elliptio fumata **(Lea, 1857)**	Gulf Slabshell	Elevated from synonymy
**Elliptio hepatica* (Lea, 1859)	Brown Elliptio	Synonym of *Elliptio icterina*
Elliptio hopetonensis **(Lea, 1838)**	Altamaha Slabshell	
Elliptio icterina **(Conrad, 1834)**	Variable Spike	

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
***Elliptio jayensis* (Lea, 1838)**	Florida Spike	Common name changed from Flat Spike
**Elliptio judithae* Clarke, 1986	Plicate Spike	Synonym of *Elliptio roanokensis*
***Elliptio lanceolata* (Lea, 1828)**	Yellow Lance	
**Elliptio lugubris* (Lea, 1834)	Sad Elliptio	Synonym of *Elliptio icterina*
***Elliptio marsupiobesa* Fuller, 1972**	Cape Fear Spike	
***Elliptio mcmichaeli* Clench and Turner, 1956**	Fluted Elephantear	
***Elliptio monroensis* (Lea, 1843)**	St. Johns Elephantear	
***Elliptio nigella* (Lea, 1852)**	Winged Spike	
***Elliptio occulta* (Lea, 1843)**	Hidden Spike	Elevated from synonymy
***Elliptio producta* (Conrad, 1836)**	Atlantic Spike	
***Elliptio pullata* (Lea, 1856)**	Gulf Spike	Elevated from synonymy
***Elliptio purpurella* (Lea, 1857)**	Inflated Spike	Elevated from synonymy
**Elliptio raveneli* (Conrad, 1834)	Carolina Spike	Synonym of *Elliptio icterina*
***Elliptio roanokensis* (Lea, 1838)**	Roanoke Slabshell	
***Elliptio shepardiana* (Lea, 1834)**	Altamaha Lance	
***Elliptio spinosa* (Lea, 1836)**	Altamaha Spinymussel	
**Elliptio steinstansana* Johnson and Clarke, 1983	Tar River Spinymussel	Reassigned to *Parvaspina*
**Elliptio waccamawensis* (Lea, 1863)	Waccamaw Spike	Synonym of *Elliptio congaraea*
**Elliptio waltoni* (Wright, 1888)	Florida Lance	Synonym of *Elliptio ahenea*
***Elliptoideus* Frierson, 1927**		
***Elliptoideus sloatianus* (Lea, 1840)**	Purple Bankclimber	
***Epioblasma* Rafinesque, 1831**		
***Epioblasma ahlstedti* Jones and Neves, 2010**	Duck River Dartersnapper	Described as new species
***Epioblasma arcaeformis* (Lea, 1831)**	Sugarspoon	
***Epioblasma aureola* Jones and Neves, 2010**	Golden Riffleshell	Species elevated from subspecies
***Epioblasma biemarginata* (Lea, 1857)**	Angled Riffleshell	
***Epioblasma brevidens* (Lea, 1831)**	Cumberlandian Combshell	
***Epioblasma capsaeformis* (Lea, 1834)**	Oyster Mussel	
***Epioblasma cincinnatiensis* (Lea, 1840)**	Ohio Riffleshell	Elevated from synonymy
***Epioblasma curtisii* (Frierson and Utterback, 1916)**	Curtis Pearlymussel	Species elevated from subspecies
***Epioblasma flexuosa* (Rafinesque, 1820)**	Leafshell	
***Epioblasma florentina* (Lea, 1857)**	Yellow Blossom	
**Epioblasma florentina aureola* Jones and Neves, 2010	Golden Riffleshell	Described as new subspecies; elevated to species
**Epioblasma florentina curtisii* (Frierson and Utterback, 1916)	Curtis Pearlymussel	Subspecies elevated to species
**Epioblasma florentina florentina* (Lea, 1857)	Yellow Blossom	Nominotypical subspecies not required
**Epioblasma florentina walkeri* (Wilson and Clark, 1914)	Tan Riffleshell	Subspecies elevated to species
***Epioblasma gubernaculum* (Reeve, 1865)**	Green Blossom	Species elevated from subspecies
***Epioblasma haysiana* (Lea, 1834)**	Acornshell	
***Epioblasma lenior* (Lea, 1842)**	Narrow Catspaw	
***Epioblasma lewisii* (Walker, 1910)**	Forkshell	
***Epioblasma metastriata* (Conrad, 1838)**	Upland Combshell	
***Epioblasma obliquata* (Rafinesque, 1820)**	Catspaw	
**Epioblasma obliquata obliquata* (Rafinesque, 1820)	Catspaw	Nominotypical subspecies not required
**Epioblasma obliquata perobliqua* (Conrad, 1836)	White Catspaw	Subspecies elevated to species
***Epioblasma othcaloogensis* (Lea, 1857)**	Southern Acornshell	
***Epioblasma penita* (Conrad, 1834)**	Southern Combshell	
***Epioblasma perobliqua* (Conrad, 1836)**	White Catspaw	Species elevated from subspecies
***Epioblasma personata* (Say, 1829)**	Round Combshell	
***Epioblasma propinqua* (Lea, 1857)**	Tennessee Riffleshell	
***Epioblasma rangiana* (Lea, 1838)**	Northern Riffleshell	Species elevated from subspecies

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
***Epioblasma sampsonii* (Lea, 1861)**	Wabash Riffleshell	
***Epioblasma stewardsonii* (Lea, 1852)**	Cumberland Leafshell	
***Epioblasma torulosa* (Rafinesque, 1820)**	Tubercled Blossom	
**Epioblasma torulosa gubernaculum* (Reeve, 1865)	Green Blossom	Subspecies elevated to species
**Epioblasma torulosa rangiana* (Lea, 1838)	Northern Riffleshell	Subspecies elevated to species
**Epioblasma torulosa torulosa* (Rafinesque, 1820)	Tubercled Blossom	Nominotypical subspecies not required
***Epioblasma triquetra* (Rafinesque, 1820)**	Snuffbox	
***Epioblasma turgidula* (Lea, 1858)**	Turgid Blossom	
***Epioblasma walkeri* (Wilson and Clark, 1914)**	Tan Riffleshell	Species elevated from subspecies
***Eurynia* Rafinesque, 1820**		Elevated from synonymy
***Eurynia dilatata* Rafinesque, 1820**	Spike	Reassigned from *Elliptio*
***Fusconaia* Simpson, 1900**		
**Fusconaia askewi* (Marsh, 1896)	Texas Pigtoe	Synonym of *Fusconaia chunii*
**Fusconaia barnesiana* (Lea, 1838)	Tennessee Pigtoe	Reassigned to *Pleuronaia*
***Fusconaia burkei* (Walker, 1922)**	Tapered Pigtoe	Reassigned from *Quincuncina*
***Fusconaia cerina* (Conrad, 1838)**	Gulf Pigtoe	Common name changed from Southern Pigtoe
***Fusconaia chunii* (Lea, 1861)**	Texas Pigtoe	Elevated from synonymy
***Fusconaia cor* (Conrad, 1834)**	Shiny Pigtoe	
***Fusconaia cuneolus* (Lea, 1840)**	Finerayed Pigtoe	
**Fusconaia ebena* (Lea, 1831)	Ebonyshell	Reassigned to *Reginaia*
***Fusconaia escambia* Clench and Turner, 1956**	Narrow Pigtoe	
***Fusconaia flava* (Rafinesque, 1820)**	Wabash Pigtoe	
**Fusconaia lananensis* (Frierson, 1901)	Triangle Pigtoe	Synonym of *Fusconaia chunii*
***Fusconaia masoni* (Conrad, 1834)**	Atlantic Pigtoe	
***Fusconaia mitchelli* (Simpson, 1895)**	False Spike	Reassigned from *Quincuncina*
***Fusconaia ozarkensis* (Call, 1887)**	Ozark Pigtoe	
***Fusconaia subrotunda* (Lea, 1831)**	Longsolid	
**Fusconaia succissa* (Lea, 1852)	Purple Pigtoe	Reassigned to *Cyclonaias*
***Glebula* Conrad, 1853**		
***Glebula rotundata* (Lamarck, 1819)**	Round Pearlshell	
***Gonidea* Conrad, 1857**		
***Gonidea angulata* (Lea, 1838)**	Western Ridged Mussel	
***Hamiota* Roe and Hartfield, 2005**		Described as new genus
***Hamiota altilis* (Conrad, 1834)**	Finelined Pocketbook	Reassigned from *Lampsilis*
***Hamiota australis* (Simpson, 1900)**	Southern Sandshell	Reassigned from *Lampsilis*
***Hamiota perovalis* (Conrad, 1834)**	Orangenacre Mucket	Reassigned from *Lampsilis*
***Hamiota subangulata* (Lea, 1840)**	Shinyrayed Pocketbook	Reassigned from *Lampsilis*
***Hemistena* Rafinesque, 1820**		
***Hemistena lata* (Rafinesque, 1820)**	Cracking Pearlymussel	
***Lampsilis* Rafinesque, 1820**		
***Lampsilis abrupta* (Say, 1831)**	Pink Mucket	
**Lampsilis altilis* (Conrad, 1834)	Finelined Pocketbook	Reassigned to *Hamiota*
**Lampsilis australis* Simpson, 1900	Southern Sandshell	Reassigned to *Hamiota*
***Lampsilis binominata* Simpson, 1900**	Lined Pocketbook	
***Lampsilis bracteata* (Gould, 1855)**	Texas Fatmucket	
***Lampsilis brittsi* Simpson, 1900**	Northern Brokenray	Species elevated from subspecies
***Lampsilis cardium* Rafinesque, 1820**	Plain Pocketbook	
***Lampsilis cariosa* (Say,1817)**	Yellow Lampmussel	
***Lampsilis dolabraeformis* (Lea, 1838)**	Altamaha Pocketbook	
***Lampsilis fasciola* Rafinesque, 1820**	Wavyrayed Lampmussel	

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
***Lampsilis floridensis* (Lea, 1852)**	Florida Sandshell	Elevated from synonymy
**Lampsilis fullerkati* Johnson, 1984	Waccamaw Fatmucket	Synonym of *Lampsilis radiata*
**Lampsilis haddletoni* Athearn, 1964	Haddleton Lampmussel	Reassigned to *Obovaria*
***Lampsilis higginsii* (Lea, 1857)**	Higgins Eye	
***Lampsilis hydiana* (Lea, 1838)**	Louisiana Fatmucket	
***Lampsilis ornata* (Conrad, 1835)**	Southern Pocketbook	
***Lampsilis ovata* (Say, 1817)**	Pocketbook	
**Lampsilis perovalis* (Conrad, 1834)	Orangenacre Mucket	Reassigned to *Hamiota*
***Lampsilis powellii* (Lea, 1852)**	Arkansas Fatmucket	
***Lampsilis radiata* (Gmelin, 1791)**	Eastern Lampmussel	
**Lampsilis radiata conspicua* (Lea, 1872)	Carolina Fatmucket	Subspecies no longer recognized
**Lampsilis radiata radiata* (Gmelin, 1791)	Eastern Lampmussel	Nominotypical subspecies not required
***Lampsilis rafinesqueana* Frierson, 1927**	Neosho Mucket	
***Lampsilis reeveiana* (Lea, 1852)**	Arkansas Brokenray	
**Lampsilis reeveiana brevicula* (Call, 1887)	Ozark Brokenray	Subspecies no longer recognized
**Lampsilis reeveiana brittsi* Simpson, 1900	Northern Brokenray	Subspecies elevated to species
**Lampsilis reeveiana reeviana* (Lea, 1852)	Arkansas Brokenray	Nominotypical subspecies not required
***Lampsilis satura* (Lea, 1852)**	Sandbank Pocketbook	
***Lampsilis siliquoidea* (Barnes, 1823)**	Fatmucket	
***Lampsilis splendida* (Lea, 1838)**	Rayed Pink Fatmucket	
***Lampsilis straminea* (Conrad, 1834)**	Rough Fatmucket	
**Lampsilis straminea claibornensis* (Lea, 1838)	Southern Fatmucket	Subspecies no longer recognized
**Lampsilis straminea straminea* (Conrad, 1834)	Rough Fatmucket	Nominotypical subspecies not required
***Lampsilis streckeri* Frierson, 1927**	Speckled Pocketbook	
**Lampsilis subangulata* (Lea, 1840)	Shinyrayed Pocketbook	Reassigned to *Hamiota*
***Lampsilis teres* (Rafinesque, 1820)**	Yellow Sandshell	
***Lampsilis virescens* (Lea, 1858)**	Alabama Lampmussel	
***Lasmigona* Rafinesque, 1831**		
***Lasmigona alabamensis* Clarke, 1985**	Alabama Heelsplitter	Species elevated from subspecies
***Lasmigona complanata* (Barnes, 1823)**	White Heelsplitter	
**Lasmigona complanata alabamensis* Clarke, 1985	Alabama Heelsplitter	Subspecies elevated to species
**Lasmigona complanata complanata* (Barnes, 1823)	White Heelsplitter	Nominotypical subspecies not required
***Lasmigona compressa* (Lea, 1829)**	Creek Heelsplitter	
***Lasmigona costata* (Rafinesque, 1820)**	Flutedshell	
***Lasmigona decorata* (Lea, 1852)**	Carolina Heelsplitter	
***Lasmigona etowaensis* (Conrad, 1849)**	Etowah Heelsplitter	Elevated from synonymy
***Lasmigona holstonia* (Lea, 1838)**	Tennessee Heelsplitter	
***Lasmigona subviridis* (Conrad, 1835)**	Green Floater	
***Lemiox* Rafinesque, 1831**		
***Lemiox rimosus* (Rafinesque, 1831)**	Birdwing Pearlymussel	
***Leptodea* Rafinesque, 1820**		
***Leptodea fragilis* (Rafinesque, 1820)**	Fragile Papershell	
***Leptodea leptodon* (Rafinesque, 1820)**	Scaleshell	
***Leptodea ochracea* (Say, 1817)**	Tidewater Mucket	
**Lexingtonia* Ortmann, 1914		Synonym of *Fusconaia*
**Lexingtonia dolabelloides* (Lea, 1840)	Slabside Pearlymussel	Reassigned to *Pleuronaia*
**Lexingtonia subplana* (Conrad, 1837)	Virginia Pigtoe	Synonym of *Fusconaia masoni*
***Ligumia* Swainson, 1840**		
***Ligumia nasuta* (Say, 1817)**	Eastern Pondmussel	
***Ligumia recta* (Lamarck, 1819)**	Black Sandshell	
***Ligumia subrostrata* (Say, 1831)**	Pondmussel	

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
***Medionidus* Simpson, 1900**		
***Medionidus acutissimus* (Lea, 1831)**	Alabama Moccasinshell	
***Medionidus conradicus* (Lea, 1834)**	Cumberland Moccasinshell	
**Medionidus mcglameriae* van der Schalie, 1939	Tombigbee Moccasinshell	Synonym of *Leptodea fragilis*
***Medionidus parvulus* (Lea, 1860)**	Coosa Moccasinshell	
***Medionidus penicillatus* (Lea, 1857)**	Gulf Moccasinshell	
***Medionidus simpsonianus* Walker, 1905**	Ochlockonee Moccasinshell	
***Medionidus walkeri* (Wright, 1897)**	Suwannee Moccasinshell	
***Megalonaias* Utterback, 1915**		
***Megalonaias nervosa* (Rafinesque, 1820)**	Washboard	
***Obliquaria* Rafinesque, 1820**		
***Obliquaria reflexa* Rafinesque, 1820**	Threehorn Wartyback	
***Obovaria* Rafinesque, 1819**		
***Obovaria arkansasensis* (Lea, 1862)**	Southern Hickorynut	Reassigned from *Villosa*
***Obovaria choctawensis* (Athearn, 1964)**	Choctaw Bean	Reassigned from *Villosa*
***Obovaria haddletoni* (Athearn, 1964)**	Haddleton Lampmussel	Reassigned from *Lampsilis*
**Obovaria jacksoniana* (Frierson, 1912)	Southern Hickorynut	Synonym of *Obovaria arkansasensis*
***Obovaria olivaria* (Rafinesque, 1820)**	Hickorynut	
***Obovaria retusa* (Lamarck, 1819)**	Ring Pink	
**Obovaria rotulata* (Wright, 1899)	Round Ebonyshell	Reassigned to *Reginaia*
***Obovaria subrotunda* (Rafinesque, 1820)**	Round Hickorynut	
***Obovaria unicolor* (Lea, 1845)**	Alabama Hickorynut	
***Parvaspina* Perkins, Gangloff, and Johnson, 2017**		Described as new genus
***Parvaspina collina* (Conrad, 1836)**	James Spinymussel	Reassigned from *Pleurobema*; publication date corrected
***Parvaspina steinstansana* (Johnson and Clarke, 1983)**	Tar River Spinymussel	Reassigned from *Elliptio*
***Pegias* Simpson, 1900**		
***Pegias fabula* (Lea, 1838)**	Littlewing Pearlymussel	
***Plectomerus* Conrad, 1853**		
***Plectomerus dombeyanus* (Valenciennes, 1827)**	Bankclimber	
***Plethobasus* Simpson, 1900**		
***Plethobasus cicatricosus* (Say, 1829)**	White Wartyback	
***Plethobasus cooperianus* (Lea, 1834)**	Orangefoot Pimpleback	
***Plethobasus cyphyus* (Rafinesque, 1820)**	Sheepnose	
***Pleurobema* Rafinesque, 1819**		
**Pleurobema altum* (Conrad, 1854)	Highnut	Considered a *nomen dubium*
***Pleurobema athearni* Gangloff, Williams, and Feminella, 2006**	Canoe Creek Clubshell	Described as new species
**Pleurobema avellanum* Simpson, 1900	Hazel Pigtoe	Synonym of *Pleurobema rubellum*
***Pleurobema beadleianum* (Lea, 1861)**	Mississippi Pigtoe	
**Pleurobema bournianum* (Lea, 1840)	Scioto Pigtoe	Synonym of *Pleurobema clava*
**Pleurobema chattanoogaense* (Lea, 1858)	Painted Clubshell	Synonym of *Pleurobema decisum*
***Pleurobema clava* (Lamarck, 1819)**	Clubshell	
**Pleurobema collina* (Conrad, 1836)	James Spinymussel	Reassigned to *Parvaspina*
***Pleurobema cordatum* (Rafinesque, 1820)**	Ohio Pigtoe	
***Pleurobema curtum* (Lea, 1859)**	Black Clubshell	
***Pleurobema decisum* (Lea, 1831)**	Southern Clubshell	
***Pleurobema fibuloides* (Lea, 1859)**	Kusha Pigtoe	Elevated from synonymy
**Pleurobema flavidulum* (Lea, 1861)	Yellow Pigtoe	Synonym of *Pleurobema perovatum*
**Pleurobema furvum* (Conrad, 1834)	Dark Pigtoe	Synonym of *Pleurobema rubellum*
***Pleurobema georgianum* (Lea, 1841)**	Southern Pigtoe	

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
**Pleurobema gibberum* (Lea, 1838)	Cumberland Pigtoe	Reassigned to *Pleuronaia*
**Pleurobema hagleri* (Frierson, 1900)	Brown Pigtoe	Synonym of *Pleurobema rubellum*
***Pleurobema hanleyianum* (Lea, 1852)**	Georgia Pigtoe	
***Pleurobema hartmanianum* (Lea, 1860)**	Cherokee Pigtoe	Elevated from synonymy
**Pleurobema johannis* (Lea, 1859)	Alabama Pigtoe	Synonym of *Pleurobema perovatum*
***Pleurobema marshalli* Frierson, 1927**	Flat Pigtoe	
**Pleurobema murrayense* (Lea, 1868)	Coosa Pigtoe	Synonym of *Pleurobema stabile*
**Pleurobema nucleopsis* (Conrad, 1849)	Longnut	Synonym of *Pleurobema georgianum*
***Pleurobema oviforme* (Conrad, 1834)**	Tennessee Clubshell	
***Pleurobema perovatum* (Conrad, 1834)**	Ovate Clubshell	
***Pleurobema plenum* (Lea, 1840)**	Rough Pigtoe	
***Pleurobema pyriforme* (Lea, 1857)**	Oval Pigtoe	
***Pleurobema riddellii* (Lea, 1861)**	Louisiana Pigtoe	
***Pleurobema rubellum* (Conrad, 1834)**	Warrior Pigtoe	
***Pleurobema rubrum* (Rafinesque, 1820)**	Pyramid Pigtoe	
***Pleurobema sintoxia* (Rafinesque, 1820)**	Round Pigtoe	
***Pleurobema stabile* (Lea, 1861)**	Coosa Pigtoe	Elevated from synonymy
***Pleurobema strodeanum* (Wright, 1898)**	Fuzzy Pigtoe	
***Pleurobema taitianum* (Lea, 1834)**	Heavy Pigtoe	
**Pleurobema troschelianum* (Lea, 1852)	Alabama Clubshell	Synonym of *Pleurobema georgianum*
***Pleurobema verum* (Lea, 1861)**	True Pigtoe	
***Pleuronaia* Frierson, 1927**		Elevated from synonymy
***Pleuronaia barnesiana* (Lea, 1838)**	Tennessee Pigtoe	Reassigned from *Fusconaia*
***Pleuronaia dolabelloides* (Lea, 1840)**	Slabside Pearlymussel	Reassigned from *Lexingtonia*
***Pleuronaia gibber* (Lea, 1838)**	Cumberland Pigtoe	Reassigned from *Pleurobema*; spelling correction of species name
***Popenais* Frierson, 1927**		
***Popenais popeii* (Lea, 1857)**	Texas Hornshell	
***Potamilus* Rafinesque, 1818**		
***Potamilus alatus* (Say, 1817)**	Pink Heelsplitter	
***Potamilus amphichaenus* (Frierson, 1898)**	Texas Heelsplitter	
***Potamilus capax* (Green, 1832)**	Fat Pocketbook	
***Potamilus inflatus* (Lea, 1831)**	Inflated Heelsplitter	Common name changed from Alabama Heelsplitter
***Potamilus metnecktayi* Johnson, 1998**	Salina Mucket	Described as new species
***Potamilus ohiensis* (Rafinesque, 1820)**	Pink Papershell	
***Potamilus purpuratus* (Lamarck, 1819)**	Bleufer	
***Ptychobranchus* Simpson, 1900**		
***Ptychobranchus fasciolaris* (Rafinesque, 1820)**	Kidneyshell	
***Ptychobranchus foremanianus* (Lea, 1842)**	Rayed Kidneyshell	Elevated from synonymy
***Ptychobranchus greenii* (Conrad, 1834)**	Triangular Kidneyshell	
***Ptychobranchus jonesi* (van der Schalie, 1934)**	Southern Kidneyshell	
***Ptychobranchus occidentalis* (Conrad, 1836)**	Ouachita Kidneyshell	
**Ptychobranchus subtentum* (Say, 1825)	Fluted Kidneyshell	Incorrect spelling of species name
***Ptychobranchus subtentus* (Say, 1825)**	Fluted Kidneyshell	Spelling correction of species name
***Pyganodon* Crosse and Fischer, 1894**		
***Pyganodon cataracta* (Say, 1817)**	Eastern Floater	
***Pyganodon fragilis* (Lamarck, 1819)**	Newfoundland Floater	
***Pyganodon gibbosa* (Say, 1824)**	Inflated Floater	
***Pyganodon grandis* (Say, 1829)**	Giant Floater	
***Pyganodon lacustris* (Lea, 1857)**	Lake Floater	Publication date corrected

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
***Quadrula* Rafinesque, 1820**		
***Quadrula apiculata* (Say, 1829)**	Southern Mapleleaf	
**Quadrula asperata* (Lea, 1861)	Alabama Orb	Reassigned to *Cyclonaias*
**Quadrula aurea* (Lea, 1859)	Golden Orb	Reassigned to *Cyclonaias*
***Quadrula couchiana* (Lea, 1860)**	Rio Grande Monkeyface	
**Quadrula cylindrica cylindrica* (Say, 1817)	Rabbitsfoot	Nominotypical subspecies not required; reassigned to *Theliderma*
**Quadrula cylindrica strigillata* (Wright, 1898)	Rough Rabbitsfoot	Subspecies no longer recognized
***Quadrula fragosa* (Conrad, 1835)**	Winged Mapleleaf	
**Quadrula houstonensis* (Lea, 1859)	Smooth Pimpleback	Reassigned to *Cyclonaias*
**Quadrula intermedia* (Conrad, 1836)	Cumberland Monkeyface	Reassigned to *Theliderma*
**Quadrula kieneriana* (Lea, 1852)	Coosa Orb	Reassigned to *Cyclonaias*
**Quadrula metanevra* (Rafinesque, 1820)	Monkeyface	Reassigned to *Theliderma*
***Quadrula nobilis* (Conrad, 1854)**	Gulf Mapleleaf	Elevated from synonymy
**Quadrula nodulata* (Rafinesque, 1820)	Wartyback	Reassigned to *Cyclonaias*
**Quadrula petrina* (Gould, 1855)	Texas Pimpleback	Reassigned to *Cyclonaias*
**Quadrula pustulosa mortoni* (Conrad, 1835)	Western Pimpleback	Subspecies elevated to species; reassigned to *Cyclonaias*
**Quadrula pustulosa pustulosa* (Lea, 1831)	Pimpleback	Nominotypical subspecies not required; reassigned to *Cyclonaias*
***Quadrula quadrula* (Rafinesque, 1820)**	Mapleleaf	
**Quadrula refulgens* (Lea, 1868)	Purple Pimpleback	Reassigned to *Cyclonaias*
***Quadrula rumphiana* (Lea, 1852)**	Ridged Mapleleaf	
**Quadrula sparsa* (Lea, 1841)	Appalachian Monkeyface	Reassigned to *Theliderma*
**Quadrula stapes* (Lea, 1831)	Stirrupshell	Reassigned to *Theliderma*
**Quadrula tuberosa* (Lea, 1840)	Rough Rockshell	Synonym of *Theliderma metanevra*
**Quincuncina* Ortmann, 1922		Synonym of *Fusconaia*
**Quincuncina burkei* Walker, 1922	Tapered Pigtoe	Reassigned to *Fusconaia*
**Quincuncina infucata* (Conrad, 1834)	Sculptured Pigtoe	Reassigned to *Cyclonaias*
**Quincuncina mitchelli* (Simpson, 1895)	False Spike	Reassigned to *Fusconaia*
***Reginaia* Campbell and Lydeard, 2012**		Described as new genus
***Reginaia apalachicola* (Williams and Fradkin, 1999)**	Apalachicola Ebonyshell	Described as new species; reassigned from *Fusconaia*
***Reginaia ebenus* (Lea, 1831)**	Ebonyshell	Reassigned from *Fusconaia*; spelling correction of species name
***Reginaia rotulata* (Wright, 1899)**	Round Ebonyshell	Reassigned from *Obovaria*
***Simpsonaias* Frierson, 1914**		
***Simpsonaias ambigua* (Say, 1825)**	Salamander Mussel	
***Sinanodonta* Modell, 1945**		Not previously reported from North America
***Sinanodonta beringiana* (Middendorff, 1851)**	Yukon Floater	Reassigned from *Anodonta*
***Sinanodonta woodiana* (Lea, 1834)**	Chinese Pondmussel	Introduced and established in New Jersey
***Strophitus* Rafinesque, 1820**		
***Strophitus connasaugaensis* (Lea, 1858)**	Alabama Creekmussel	
***Strophitus subvexus* (Conrad, 1834)**	Southern Creekmussel	
***Strophitus undulatus* (Say, 1817)**	Creeper	
***Theliderma* Swainson, 1840**		Elevated from synonymy
***Theliderma cylindrica* (Say, 1817)**	Rabbitsfoot	Reassigned from *Quadrula*
***Theliderma intermedia* (Conrad, 1836)**	Cumberland Monkeyface	Reassigned from *Quadrula*
***Theliderma metanevra* (Rafinesque, 1820)**	Monkeyface	Reassigned from *Quadrula*
***Theliderma sparsa* (Lea, 1841)**	Appalachian Monkeyface	Reassigned from *Quadrula*
***Theliderma stapes* (Lea, 1831)**	Stirrupshell	Reassigned from *Quadrula*

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
***Toxolasma* Rafinesque, 1831**		
***Toxolasma corvunculus* (Lea, 1868)**	Southern Purple Lilliput	
***Toxolasma cylindrellus* (Lea, 1868)**	Pale Lilliput	
***Toxolasma lividum* Rafinesque, 1831**	Purple Lilliput	Spelling correction of species name; parentheses unnecessary
**Toxolasma lividus* (Rafinesque, 1831)	Purple Lilliput	Incorrect spelling of species name
**Toxolasma mearnsi* (Simpson, 1900)	Western Lilliput	Synonym of *Toxolasma texasiense*
***Toxolasma parvum* (Barnes, 1823)**	Lilliput	Spelling correction of species name
**Toxolasma parvus* (Barnes, 1823)	Lilliput	Incorrect spelling of species name
***Toxolasma paulum* (Lea, 1840)**	Iridescent Lilliput	Spelling correction of species name
**Toxolasma paulus* (Lea, 1840)	Iridescent Lilliput	Incorrect spelling of species name
***Toxolasma pullus* (Conrad, 1838)**	Savannah Lilliput	
***Toxolasma texasiense* (Lea, 1857)**	Texas Lilliput	Spelling correction of species name
**Toxolasma texasiensis* (Lea, 1857)	Texas Lilliput	Incorrect spelling of species name
***Tritogonia* Agassiz, 1852**		
***Tritogonia verrucosa* (Rafinesque, 1820)**	Pistolgrip	
***Truncilla* Rafinesque, 1819**		
***Truncilla cognata* (Lea, 1860)**	Mexican Fawnsfoot	
***Truncilla donaciformis* (Lea, 1828)**	Fawnsfoot	
***Truncilla macrodon* (Lea, 1859)**	Texas Fawnsfoot	
***Truncilla truncata* Rafinesque, 1820**	Deertoe	
***Uniomerus* Conrad, 1853**		
***Uniomerus carolinianus* (Bosc, 1801)**	Eastern Pondhorn	Common name changed from Florida Pondhorn
***Uniomerus columbensis* (Lea, 1857)**	Apalachicola Pondhorn	Elevated from synonymy
***Uniomerus declivis* (Say, 1831)**	Tapered Pondhorn	
***Uniomerus tetralasmus* (Say, 1831)**	Pondhorn	
***Utterbackia* Baker, 1927**		
***Utterbackia imbecillis* (Say, 1829)**	Paper Pondshell	
***Utterbackia peggyae* (Johnson, 1965)**	Florida Floater	
***Utterbackia peninsularis* Bogan and Hoeh, 1995**	Peninsular Floater	
***Utterbackiana* Frierson, 1927**		Elevated from synonymy
***Utterbackiana couperiana* (Lea, 1840)**	Barrel Floater	Reassigned from *Anodonta*
***Utterbackiana hartfieldorum* (Williams, Bogan, and Garner, 2009)**	Cypress Floater	Described as new species; reassigned from *Anodonta*
***Utterbackiana heardi* (Gordon and Hoeh, 1995)**	Apalachicola Floater	Reassigned from *Anodonta*
***Utterbackiana implicata* (Say, 1829)**	Alewife Floater	Reassigned from *Anodonta*
***Utterbackiana suborbiculata* (Say, 1831)**	Flat Floater	Reassigned from *Anodonta*
***Venustaconcha* Frierson, 1927**		
***Venustaconcha ellipsiformis* (Conrad, 1836)**	Ellipse	
***Venustaconcha pleasii* (Marsh, 1891)**	Bleedingtooth Mussel	
***Venustaconcha trabalis* (Conrad, 1834)**	Tennessee Bean	Reassigned from *Villosa*; common name changed from Cumberland Bean
***Venustaconcha troostensis* (Lea, 1834)**	Cumberland Bean	Elevated from synonymy
***Villosa* Frierson, 1927**		
**Villosa amygdala* (Lea, 1843)	Florida Rainbow	Incorrect spelling of species name
***Villosa amygdalum* (Lea, 1843)**	Florida Rainbow	Spelling correction of species name
**Villosa arkansasensis* (Lea, 1862)	Ouachita Creekshell	Reassigned to *Obovaria*
**Villosa choctawensis* Athearn, 1964	Choctaw Bean	Reassigned to *Obovaria*
***Villosa constricta* (Conrad, 1838)**	Notched Rainbow	
***Villosa delumbis* (Conrad, 1834)**	Eastern Creekshell	
***Villosa fabalis* (Lea, 1831)**	Rayed Bean	

Table 2, continued.

Scientific Name	Common Name	Changes in Scientific and Common Names
***Villosa iris* (Lea, 1829)**	Rainbow	
***Villosa lienosa* (Conrad, 1834)**	Little Spectaclecase	
***Villosa nebulosa* (Conrad, 1834)**	Alabama Rainbow	
***Villosa ortmanni* (Walker, 1925)**	Kentucky Creekshell	
**Villosa perpurpurea* (Lea, 1861)	Purple Bean	Synonym of *Venustaconcha trabalis*
***Villosa sima* (Lea, 1838)**	Caney Fork Rainbow	Elevated from synonymy
***Villosa taeniata* (Conrad, 1834)**	Painted Creekshell	
**Villosa trabalis* (Conrad, 1834)	Cumberland Bean	Reassigned to *Venustaconcha*
***Villosa umbrans* (Lea, 1857)**	Coosa Creekshell	Species elevated from subspecies
**Villosa vanuxemensis umbrans* (Lea, 1857)	Coosa Creekshell	Subspecies elevated to species
***Villosa vanuxemensis* (Lea, 1838)**	Mountain Creekshell	
**Villosa vanuxemensis vanuxemensis* (Lea, 1838)	Mountain Creekshell	Nominotypical subspecies not required
***Villosa vaughaniana* (Lea, 1838)**	Carolina Creekshell	
***Villosa vibex* (Conrad, 1834)**	Southern Rainbow	
***Villosa villosa* (Wright, 1898)**	Downy Rainbow	

genus, species, and subspecies levels relative to previous lists. We recognize in total 298 freshwater mussel species from the United States and Canada. These comprise the families Margaritiferidae with one genus and five species and Unionidae with 54 genera and 293 species (Table 2). Turgeon et al. (1998) recognized in total 304 taxa: Margaritiferidae with two genera and five species and Unionidae with 49 genera, 286 species, and 13 subspecies. We summarize our changes to Turgeon et al. (1998) as follows. We recognize eight additional genera, including three recently described (*Hamiota*, *Parvaspina*, and *Reginaia*), four elevated from synonymy (*Eurynia*, *Pleuronaia*, *Theliderma*, and *Utterbackiana*), and one newly reported from North America (*Sinanodonta*). We place in synonymy four genera, including one in the Margaritiferidae (*Cumberlandia*) and three in the Unionidae (*Arkansia*, *Lexingtonia*, and *Quincuncina*). We recognize 25 additional species (all Unionidae), including four newly described species and 21 species elevated from synonymy. We place in synonymy 29 species and consider *Pleurobema altum* a nomen dubium, and we reassigned 41 species to other genera. We corrected the specific epithet spelling for eight species, corrected the date of publication for four, and changed the common names of five. Last, we recognized no subspecies, elevating 10 subspecies to species status and subsuming four subspecies into their nominal species (see Methods).

Margaritiferidae Henderson, 1929

Turgeon et al. (1998) recognized two genera in Margaritiferidae, *Cumberlandia* (one species) and *Margaritifera* (four species). On the basis of shell morphology and soft anatomy, Smith (2001) placed *Cumberlandia* in *Margaritanopsis* and *Margaritifera* (in part) in *Pseudunio*, but this classification was not widely accepted. In a molecular phylogenetic analysis, Huff et al. (2004) considered *Cumberlandia* a junior synonym of *Margaritifera*, and this classification was followed by some subsequent authors (e.g., Graf and Cummings 2007, 2017; Cummings and Graf 2010), but others continued to recognize the genus as valid (e.g., Williams et al. 2008; Watters et al. 2009; Haag 2012). A more comprehensive phylogeny of the Margaritiferidae that included eight of 13 currently recognized species (three from North America) retained the use of *Cumberlandia* (Bolotov et al. 2015). However, based on more recent evidence (Bolotov et al. 2016; Araujo et al. 2017), we consider *Cumberlandia* a junior synonym of *Margaritifera*.

Cumberlandia *Ortmann, 1912*.—Turgeon et al. (1998) recognized one species, *Cumberlandia monodonta*. We place *Cumberlandia* in the synonymy of *Margaritifera* (see Margaritiferidae).

Margaritifera *Schumacher, 1816*.—Turgeon et al. (1998) recognized four species of *Margaritifera*. Placement of *Cumberlandia* in the synonymy of *Margaritifera* brings the number of recognized species to five (see Margaritiferidae).

Unionidae Rafinesque, 1820

Turgeon et al. (1998) recognized 49 genera, 286 species, and 13 subspecies in Unionidae. We recognize 54 genera, 293 species, and no subspecies. We provide support for and discussion of these changes in the following assessments of genera.

Actinonaias *Crosse and Fischer, 1894*.—Turgeon et al. (1998) recognized two species, *Actinonaias ligamentina* and *Actinonaias pectorosa*. Molecular analyses (e.g., Campbell et al. 2005; Zanatta and Murphy 2006) found that the two species of *Actinonaias* together did not represent a monophyletic grouping, but the position of each of these lineages within the Lampsilini was unresolved. The type locality for *Actinonaias* is central Mexico, and 10 recognized species are restricted to this region (Graf and Cummings 2017), but no species attributable to *Actinonaias* occur between Mexico and the range of *ligamentina* and *pectorosa* in the central United States and southern Canada. No phylogenetic research has examined relationships among Mexican *Actinonaias* and *ligamentina* and *pectorosa*, but it is unlikely they are closely related considering the disjunct distribution and lack of precedent for such a geographical pattern in other freshwater taxa (e.g., Miller et al. 2005). *Actinonaias ligamentina* and *pectorosa* require placement in two different genera, but at this time we retain these two species in the genus *Actinonaias* pending the outcome of further phylogenetic research.

Alasmidonta *Say, 1818*.—Turgeon et al. (1998) recognized 12 species, and recent evidence supports no changes to this classification.

Amblema *Rafinesque, 1820*.—Turgeon et al. (1998) recognized three species, and recent evidence supports no changes to this classification.

Anodonta *Lamarck, 1799*.—Turgeon et al. (1998) recognized 10 species. Mock et al. (2004) and Zanatta et al. (2007) found *Anodonta* to be polyphyletic, with eastern North American species forming a monophyletic clade distinct from the one that includes the type species (*Anodonta cygnea*, which occurs in Eurasia) and western North American *Anodonta*. Without discussion, Graf and Cummings (2007) and Cummings and Graf (2010) placed *Anodonta couperiana*, *A. heardi*, and *A. suborbiculata* in *Utterbackia*, and *A. implicata* in *Pyganodon*. Because no supporting evidence was provided, we do not recognize these changes. The next available genus for the eastern North American clade (*A. couperiana*, *A. heardi*, *A. suborbiculata*, and *A. implicata*) identified as distinct by Mock et al. (2004) is *Utterbackiana*. *Anodonta hartfieldorum* Williams, Bogan, and Garner, 2009, was described subsequently and also belongs to *Utterbackiana* (see *Utterbackiana*).

In a phylogenetic analysis of western North American *Anodonta*, Chong et al. (2008) found *A. beringiana* to be more closely related to the Asian species *Sinanodonta woodiana* than to North American species. Based on this evidence, we reassign *beringiana* to *Sinanodonta* (see *Sinanodonta*).

We retain the remaining four western North American species within *Anodonta* (*A. californiensis*, *A. kennerlyi*, *A. nuttalliana*, and *A. oregonensis*) based on their phylogenetic affinity to Eurasian *Anodonta* (Mock et al. 2004; Zanatta et al. 2007; Chong et al. 2008). *Anodonta dejecta* was recognized by Turgeon et al. (1998), Graf and Cummings (2007), and Cummings and Graf (2010). This species is treated as a synonym of *A. californiensis* by Bequaert and Miller (1973) and the Arizona Game and Fish Department (2017). We do not recognize *A. dejecta*, which is here placed in synonymy of *A. californiensis*.

Anodontoides *Simpson in Baker, 1898*.—Turgeon et al. (1998) recognized two species. One additional species, *Anodontoides denigrata*, was recognized without discussion by Neves et al. (1997) and Cicerello and Schuster (2003). Haag and Cicerello (2016) recognized *A. denigrata* on the basis of molecular data showing that upper Cumberland River drainage populations were distinct from *A. ferussacianus* (Bogan and Raley 2013), and we recognize this species for the same reason. Bogan and Raley (2013) referred to *A. denigrata* as *A. argenteus* (Lea, 1840), for which the type locality is Stones River, Tennessee. The Stones River is a tributary of the middle Cumberland River and well downstream of the putative distribution of *A. denigrata* and other species considered endemic to the upper Cumberland River drainage upstream of the hypothesized original location of Cumberland Falls (Haag and Cicerello 2016). Until further research delineates this species' distribution more precisely, we use *A. denigrata*, for which the type locality is in the upper Cumberland River drainage (Clear Fork, Campbell County, Tennessee; see Ortmann 1918). Ahlstedt et al. (2016) reported a possibly distinct *Anodontoides* species from the Powell River, Virginia, but further work is needed to determine its validity and taxonomy.

Arcidens *Simpson, 1900*.—Turgeon et al. (1998) recognized one species, *Arcidens confragosus*. Clarke (1981) considered *Arkansia* (see *Arkansia*) a junior synonym of *Arcidens* (see also Graf and Cummings 2007), and this classification was supported by morphological and molecular data (Inoue et al. 2014). We recognize two species of *Arcidens*.

Arkansia *Ortmann and Walker, 1912*.—*Arkansia* was described as a monotypic genus including *A. wheeleri*, which was recognized by Turgeon et al. (1998). We place *Arkansia* in the synonymy of *Arcidens* (see *Arcidens*).

Cyclonaias *Pilsbry in Ortmann and Walker, 1922*.—Turgeon et al. (1998) recognized *Cyclonaias*, which has long been considered a monotypic genus for *C. tuberculata*. *Cyclonaias tuberculata* has been aligned with the Quadrulini based on morphological (e.g., Frierson 1927; Modell 1964) and protein polymorphism data (Davis and Fuller 1981). Heard and Guckert (1971) placed *Cyclonaias* in the Pleurobemini based on its ectobranchous brooding (see also Graf and Cummings 2007). However, it appears that ectobranchy arose multiple times (Davis and Fuller 1981; Graf 2002; Roe and Hoeh 2003), meaning that this trait does not necessarily exclude *Cyclonaias* from the Quadrulini, and some female *C. tuberculata* brood glochidia in all four gills (Frierson 1927).

Recent molecular studies consistently supported inclusion of *Cyclonaias* in the Quadrulini, but they further show that it is a member of a monophyletic clade including *Q. pustulosa* and related species (Campbell et al. 2005; Campbell and Lydeard 2012b). Serb et al. (2003) did not support this relationship, but these results were later attributed to an error in sample labeling (Campbell and Lydeard 2012b). However, Serb et al. (2003) as well as Campbell et al. (2005) and Campbell and Lydeard (2012b) support the monophyly of the *Quadrula pustulosa* clade and its distinctiveness from other species of *Quadrula* (see *Quadrula* and *Theliderma*). In addition to *Cyclonaias tuberculata*, the *Quadrula pustulosa* clade identified by these studies includes the following species recognized by Turgeon et al. (1998): *Q. asperata*, *Q. aurea*, *Q. houstonensis*, *Q. nodulata*, *Q. petrina*, *Q. pustulosa*, and *Q. refulgens*, as well as *Fusconaia succissa* and *Quincuncina infucata* (see *Fusconaia* and *Quincuncina*).

The name *Quadrula* is not available for the *Q. pustulosa* clade because the type species, *Q. quadrula*, is a member of another distinct, monophyletic clade (see *Quadrula*). Graf and Cummings (2007) elevated the generic name *Amphinaias* Crosse and Fischer, 1894, for the *Q. pustulosa* clade. The type species for *Amphinaias* (by original designation) is *Unio couchianus* Lea, 1860, which has a quadrate shell and sulcus (but lacks pustules) similar to the *Q. quadrula* clade. This morphology is very different from the rounded, pustulose shells of the *Q. pustulosa* clade. *Quadrula couchiana* is considered extinct and genetic data are unavailable; however, we do not consider *Amphinaias* an available name for the *Q. pustulosa* clade because of the strongly divergent morphology of the type species. Campbell and Lydeard (2012b) proposed *Rotundaria* Rafinesque, 1820, as a name for the *Q. pustulosa* clade, presuming its availability based on statements in Valenciennes (1827). However, Valenciennes noted that Rafinesque had confused two species, one for which he kept Rafinesque's name *Unio verrucosa* and named the other *Unio tuberculosa* [sic]. As such, Valenciennes's statement cannot be accepted as a subsequent designation of *Obliquaria tuberculata* Rafinesque, 1820, as the type species of *Rotundaria* (P. Bouchet, Muséum National d'Histoire Naturelle, Paris, personal communication), and Herrmannsen (1848) later designated *Obliquaria subrotunda* Rafinesque, 1820, as the type species of *Rotundaria*. Rafinesque did not select a type species for *Rotundaria* and because more than one species was included by him in the genus, the type species cannot be fixed by monotypy. Therefore, *Rotundaria* is not available for the *Q. pustulosa* clade. Frierson (1927) erected the subgenus *Bullata* for *Q. pustulosa* but realized this was preoccupied and created the replacement name *Pustulosa* with the same type species. Thus, *Cyclonaias* becomes the oldest available name for this group.

Of the 10 species discussed above as members of *Cyclonaias*, three were not recognized by Turgeon et al. (1998) (*C. archeri*, *C. kieneriana*, and *C. kleiniana*), and one was considered a subspecies (*C. mortoni*, as *Quadrula pustulosa mortoni*). Graf and Cummings (2007) elevated *Q. archeri* from synonymy with *Q. asperata*, but they provided no justification for this change. The distinctiveness of *C. archeri* was recognized by Williams et al. (2008) based on its morphology, absence of intergrades, and isolated and restricted distribution. We recognize *C. archeri*. The distinctiveness of *C. kieneriana* was recognized by Williams et al. (2008) based on shell morphology; however, it was not supported by molecular data (Serb et al. 2003), but that study included only one specimen of this putative taxon. We recognize *C. kieneriana* until additional information becomes available (see Williams et al. 2008). *Cyclonaias kleiniana* was synonymized under *Quincuncina infucata* by Clench and Turner (1956), but molecular studies supported the distinctiveness of these species and their inclusion in *Cyclonaias* (Lydeard et al. 2000; Campbell and Lydeard 2012b). Molecular data supported the distinctiveness of *C. mortoni* from *C. pustulosa* (Serb et al. 2003). In summary, we recognize *Cyclonaias* as including 14 species: *C. tuberculata*, seven species recognized by Turgeon et al. (1998) under *Quadrula*, one subspecies recognized by Turgeon et al. (1998) but now elevated to species status (*C. mortoni*), two species recognized by Turgeon et al. (1998) in different genera (*C. infucata* and *C. succissa*), and three species elevated from synonymy (*C. archeri*, *C. kieneriana*, and *C. kleiniana*).

Cyprogenia *Agassiz, 1852*.—Turgeon et al. (1998) recognized two species. Subsequent molecular data suggested cryptic species diversity in the genus (Serb and Barnhart 2008; Grobler et al. 2011). The most recent molecular analysis of *Cyprogenia* identified three independent evolutionary lineages: *C. aberti* in the Ozark drainages of Arkansas, Missouri, and Kansas; *C. stegaria* in the Ohio River Basin; and a third lineage in the Ouachita River drainage in Arkansas (Chong et al. 2016). Confusion regarding the type locality of *Unio lamarckianus* Lea, 1852, requires resolution to determine whether that name is available for the Ouachita River drainage population. We recognize the distinctiveness of this species but defer including it in our list until a specific epithet can be designated.

Cyrtonaias *Crosse and Fischer, 1894*.—Turgeon et al. (1998) recognized one species, *Cyrtonaias tampicoensis*, and recent evidence supports no changes to this classification. Five other species are recognized, all of which occur in Mexico or Central America (Graf and Cummings 2017).

Disconaias *Crosse and Fischer, 1894*.—Turgeon et al. (1998) recognized one species, *Disconaias salinasensis* Simpson in Dall, 1908, which was subsequently placed in the synonymy of *Disconaias fimbriata* by Graf and Cummings (2007). Five other species are recognized, all of which occur in Mexico (Graf and Cummings 2017). We recognize *Disconaias fimbriata* as the only species of the genus occurring in the United States (Rio Grande drainage).

Dromus *Simpson, 1900*.—Turgeon et al. (1998) recognized one species, *Dromus dromas*, and recent evidence supports no changes to this classification.

Ellipsaria *Rafinesque, 1820*.—Turgeon et al. (1998) recognized one species, *Ellipsaria lineolata*, and recent evidence supports no changes to this classification.

Elliptio *Rafinesque, 1819*.—Turgeon et al. (1998) recognized 36 species, making it the largest unionid genus in the United States and Canada, but species concepts within this group remain mostly untested, and their highly variable shell morphology precludes traditional approaches for species diagnosis. Recent molecular studies have largely supported the monophyly of *Elliptio* with two exceptions (Campbell et al. 2005; Campbell and Lydeard 2012b; Perkins et al. 2017). *Elliptio dilatata*, which is morphologically and anatomically similar to many *Elliptio*, is not a member of this group; we recognize reassignment of this species to *Eurynia* (Campbell and Lydeard 2012b). We also recognize reassignment of *Elliptio steinstansana* to *Parvaspina* based on molecular data (Perkins et al. 2017). It is important to note that phylogenetic affinities remain unknown for most species that we currently recognize under *Elliptio* and some may prove to be members of other genera (e.g., *Eurynia*; Elderkin et al. 2008; Campbell and Lydeard 2012b).

Because of our poor understanding of species diversity within *Elliptio*, we largely retain the classification of Turgeon et al. (1998) with the following exceptions. We stress that this classification is provisional and meant to provide a stable, working hypothesis for diversity within the genus. We elevate from synonymy four species of *Elliptio*: *E. fumata* (from *E. complanata*), *E. occulta* and *E. pullata* (from *E. icterina*), and *E. purpurella* (from *E. arctata* and *E. strigosa*); these changes are based primarily on differences in shell morphology (Brim Box and Williams 2000; Williams et al. 2008, 2011, 2014). We place eight species into synonymy. Four Atlantic Slope species (*E. errans*, *E. hepatica*, *E. lugubris*, and *E. raveneli*) were recognized by Turgeon et al. (1998) based on Davis and Mulvey (1993). The research by Davis and Mulvey (1993) was confined almost exclusively to the Savannah River drainage and has no context within the greater Atlantic Coast region. The validity of these species has not been evaluated further. We return these species to synonymy following Johnson (1970) as follows: *E. errans* is synonymized under *E. complanata*; and *E. hepatica*, *E. lugubris*, and *E. raveneli* are synonymized under *E. icterina*. We place *Elliptio waccamawensis* into the synonymy of *E. congaraea* based on molecular data (McCartney et al. 2016). We place the following species into synonymy based on examination of shell type material by Clarke (1992) and Williams et al. (2011, 2014): *E. waltoni* (synonymized under *E. ahenea*), *E. judithae* (synonymized under *E. roanokensis*), and *E. buckleyi* (synonymized under *E. jayensis*). After these changes, we recognize 30 species of *Elliptio*, and it remains the largest unionid genus in the United States and Canada.

Turgeon et al. (1998) listed the common names Flat Spike and Florida Shiny Spike for *Elliptio jayensis* and *E. buckleyi*, respectively. We follow the recommendation of Williams et al. (2014) that the common name of *E. jayensis* be changed to Florida Spike because the species is largely endemic to that state and is neither consistently flat nor shiny.

Elliptoideus *Frierson, 1927*.—Turgeon et al. (1998) recognized one species, *Elliptoideus sloatianus*, and recent evidence supports no changes to this classification.

Epioblasma *Rafinesque, 1831*.—Turgeon et al. (1998) recognized 20 species and five subspecies. Our changes to this classification involve recognition of two newly described cryptic species, elevating one species from synonymy, and elevating subspecies to species status. We recognize *Epioblasma ahlstedti* Jones and Neves, 2010, a cryptic species formerly included within *E. capsaeformis*, and we recognize and elevate to species status *Epioblasma aureola* Jones and Neves, 2010, formerly identified as *E. florentina walkeri* but described as *E. florentina aureola* Jones and Neves, 2010.

Epioblasma cincinnatiensis was not recognized by Turgeon et al. (1998), and it has been considered a synonym (e.g., Parmalee and Bogan 1998) or a subspecies (e.g., Morrison 1942) of *Epioblasma torulosa*. Williams et al. (2008) elevated this species from synonymy based on examination of shell type material. Watters et al. (2009) also recognized this taxon but placed it in the synonymy of *Epioblasma phillipsii* (Conrad, 1835). However, *E. phillipsii* is considered a synonym of *Obliquaria reflexa* (see Williams et al. 2008). We follow Williams et al. (2008) in recognizing *E. cincinnatiensis*.

Turgeon et al. (1998) recognized eight subspecies of *Epioblasma* in three nominal species: *florentina* (three), *obliquata* (two), and *torulosa* (three). A conclusive assessment of the taxonomic status of these taxa may be impossible at this time because half are considered extinct (*E. florentina florentina*, *E. f. curtisii*, *E. torulosa torulosa*, and *E. t. gubernaculum*). Cummings and Berlocher (1990) found no evidence of intergradation between *E. t. torulosa* and *E. t. rangiana* and both taxa co-occurred at many sites; based on this evidence, we elevate these subspecies to species status. *Epioblasma aureola* and *E. walkeri* represent morphologically and genetically distinct sister taxa (Jones and Neves 2010, as *E. florentina aureola* and *E. florentina walkeri*). These taxa appear to be restricted to two different river systems (Tennessee and Cumberland, respectively); based on the low probability of exchange between these populations and their distinctiveness, we recognize and elevate to full species status *E. aureola* and *E. walkeri*. There is little information with which to assess the taxonomic status of *E. florentina florentina*, *E. florentina curtisii*, *E. obliquata obliquata*, *E. obliquata perobliqua*, and *E. torulosa gubernaculum*, but all have distinctive shell morphology or occupy distinct geographical regions and we recognize all these taxa as distinct species (see Methods).

We recognize 28 *Epioblasma* species, making it the second largest unionid genus in the United States and Canada.

Eurynia *Rafinesque, 1820*.—*Eurynia* was not recognized in Turgeon et al. (1998). *Eurynia* was elevated from synonymy by Campbell and Lydeard (2012b) to accommodate *Elliptio dilatata*, which consistently falls outside the *Elliptio* clade in molecular analyses (see also Perkins et al. 2017). We consider *Eurynia* monotypic at this time, but more inclusive molecular studies may identify other species that belong to this genus, including some now assigned to *Elliptio* (Elderkin et al. 2008; Campbell and Lydeard 2012b).

Fusconaia *Simpson, 1900*.—Turgeon et al. (1998) recognized 13 species. Several studies showed that the genus *Fusconaia* as portrayed by Turgeon et al. (1998) was polyphyletic (Lydeard et al. 2000; Serb et al. 2003; Campbell et al. 2005; Campbell and Lydeard 2012a, 2012b; Pfeiffer et al. 2016). Based on these results, we reassign three species recognized by Turgeon et al. (1998) to other genera: *F. succissa* to *Cyclonaias*, *F. barnesiana* to *Pleuronaia*, and *F. ebenus* to *Reginaia*. *Pleuronaia* was resurrected to accommodate *F. barnesiana*, along with two other species in the clade (Williams et al. 2008; Campbell and Lydeard 2012a, 2012b; see *Pleuronaia*). *Reginaia* was described to accommodate *F.*

ebenus and two other species (Campbell and Lydeard 2012a; see *Reginaia*).

These studies also showed that several species assigned to other genera belonged in *Fusconaia*. Based on these results, *Quincuncina* is a junior synonym of *Fusconaia*, and we reassign *Q. burkei* and *Q. mitchelli* to *Fusconaia* (Lydeard et al. 2000; Serb et al. 2003; Campbell et al. 2005; Pfeiffer et al. 2016; see *Cyclonaias*, *Quadrula*, and *Quincuncina*). *Lexingtonia* was placed in the synonymy of *Fusconaia* when its type species, *L. subplana*, was determined a junior synonym of *Fusconaia masoni* based on molecular data (Bogan et al. 2003).

Fusconaia chunii was not recognized by Turgeon et al. (1998), but they recognized two other *Fusconaia* from Texas: *F. askewi* and *F. lananensis*. Subsequent molecular data showed that all *Fusconaia* in Texas drainages from the Sabine River west belonged to a single species (Burlakova et al. 2012). However, *Unio chunii* Lea, 1861, has priority over *Unio askewi* Marsh, 1896, and *Quadrula lananensis* Frierson, 1901, so we place *F. askewi* and *F. lananensis* in the synonymy of *F. chunii*.

We adopt the former common name for *F. askewi*, Texas Pigtoe, for *F. chunii* because it is descriptive of the species' range. Turgeon et al. (1988) listed the common name Gulf Pigtoe for *Fusconaia cerina*, but it was changed to Southern Pigtoe in Turgeon et al. (1998) without comment. However, Turgeon et al. (1998) also used Southern Pigtoe as the common name of *Pleurobema georgianum*. We designate the common name Gulf Pigtoe for *F. cerina*.

In summary, we recognize 11 species of *Fusconaia*, including eight species recognized by Turgeon et al. (1998) under *Fusconaia*, two species recognized by Turgeon et al. (1998) in other genera, and one species elevated from synonymy.

Glebula *Conrad, 1853*.—Turgeon et al. (1998) recognized one species, *Glebula rotundata*, and recent evidence supports no changes to this classification.

Gonidea *Conrad, 1857*.—Turgeon et al. (1998) recognized one species, *Gonidea angulata*, and recent evidence supports no changes to this classification.

Hamiota *Roe and Hartfield, 2005*.—*Hamiota* was described subsequent to Turgeon et al. (1998) to accommodate a monophyletic clade of four species that produce superconglutinates (Roe et al. 2001). They were previously recognized under *Lampsilis*: *L. altilis*, *L. australis*, *L. perovalis*, and *L. subangulata* (Roe and Hartfield 2005). We recognize all four of these species under *Hamiota*.

Hemistena *Rafinesque, 1820*.—Turgeon et al. (1998) recognized one species, *Hemistena lata*, and recent evidence supports no changes to this classification.

Lampsilis *Rafinesque, 1820*.—Turgeon et al. (1998) recognized 28 species and four subspecies. Molecular data indicated that *Lampsilis*, as presented by Turgeon et al. (1998), is polyphyletic (Graf and Ó Foighil 2000; Campbell et al. 2005). There are likely unrecognized taxa in the genus *Lampsilis* (e.g., in Arkansas; Harris et al. 2009). The genus *Hamiota* was described to accommodate a monophyletic clade of four species, *Lampsilis altilis*, *L. australis*, *L. perovalis*, and *L. subangulata* (Roe and Hartfield 2005), and we recognize reassignment of these species from *Lampsilis* to *Hamiota*. We also recognize reassignment of *Lampsilis haddletoni* to *Obovaria* (Williams et al. 2008; see *Obovaria*). In addition to *Hamiota*, molecular data suggested the existence of at least two other paraphyletic clades within *Lampsilis* as recognized by Turgeon et al. (1998). *Lampsilis cardium*, *L. ornata*, and *L. ovata* formed a monophyletic clade sister to *Hamiota*, and *L. siliquoidea* and *L. teres* were members of a clade sister to the latter two groups; however, these groupings were not consistently or strongly supported, and the analyses did not include other species of putative *Lampsilis* (Campbell et al. 2005). Additional generic-level changes regarding *Lampsilis* will likely occur in the future, but we retain traditional use of this genus for all species except those reassigned to *Hamiota* and *Obovaria*.

Lampsilis floridensis was not recognized by Turgeon et al. (1998), and formerly it was recognized as a subspecies (Clench and Turner 1956) or synonym (Burch 1975) of *Lampsilis teres*. We recognize *L. floridensis* as a full species based on shell morphology, unpublished molecular data, and its allopatric distribution (Williams et al. 2008).

Turgeon et al. (1998) recognized nominal *Lampsilis reeveiana* along with two subspecies, *L. r. brevicula* and *L. r. brittsi*. Molecular data showed that *brittsi* populations from the Missouri River drainage formed a well-supported monophyletic clade separate from nominal *reeveiana*, but there was no morphological or genetic distinction between nominal *L. reeveiana* and *L. r. brevicula* (Harris et al. 2004). Based on these data, we follow McMurray et al. (2012) in recognizing *L. brittsi* and *L. reeveiana* as species and placing *L. reeveiana brevicula* into the synonymy of *L. reeveiana*.

Turgeon et al. (1998) recognized nominal *Lampsilis radiata* and one subspecies, *L. r. conspicua*. However, molecular and shell morphology data did not support the distinctiveness of *L. r. conspicua* (Stiven and Alderman 1992), and we place this taxon into the synonymy of *Lampsilis radiata*. Turgeon et al. (1998) also recognized *Lampsilis fullerkati*, but we recognize placement of that species into the synonymy of *L. radiata* based on molecular data (McCartney et al. 2016).

Turgeon et al. (1998) recognized nominal *Lampsilis straminea* and one subspecies, *L. s. claibornensis*. *Lampsilis straminea straminea* is restricted to the Black Belt Prairie region of Alabama and Mississippi and is characterized by a profusion of fine, concentric ridges on the shell, which are absent in *L. s. claibornensis*. However, concentric ridges are present in some other mussels inhabiting streams in the Black Belt Prairie region and are most likely environmentally induced and not due to genetic differences (Williams et al. 2008). We do not recognize the taxonomic validity of these shell forms and place *L. s. claibornensis* in the synonymy of *Lampsilis straminea*. The common name of *Lampsilis s. straminea*, Rough Fatmucket (Turgeon et al. 1998), is descriptive of individuals in only a small portion of its range (i.e., the Black Belt Prairie). Therefore, we retain the common name for *L. straminea claibornensis*, Southern Fatmucket, for *L. straminea*.

In summary, we recognize 24 species of *Lampsilis* including one species elevated from synonymy and two species elevated from subspecies. *Lampsilis* is the third largest genus in the family Unionidae following *Elliptio* (30) and *Epioblasma* (28).

Lasmigona *Rafinesque, 1831*.—Turgeon et al. (1998) recognized six species and one subspecies. Williams et al. (2008) elevated *Lasmigona complanata alabamensis* to species status based on examination of museum shell material, and molecular data supported the distinctiveness of this taxon (King et al. 1999). Williams et al. (2008) also recognized Mobile Basin populations of *Lasmigona holstonia* as a distinct species based on unpublished molecular data and the occurrence of these populations in two different river systems. They resurrected from synonymy *Lasmigona etowaensis* to refer to Mobile Basin populations and retained *L. holstonia* to refer to Tennessee and Ohio River drainage populations. We recognize all three of these species.

Molecular studies showed that *Lasmigona* is polyphyletic: *L. alabamensis*, *L. complanata*, and *L. costata* formed a monophyletic clade, and *L. compressa* and *L. subviridis* represented another monophyletic clade more closely related to *Alasmidonta* (King et al. 1999). However, this study did not include all species of *Lasmigona*, and a broader study within the context of the tribe Anodontini is needed to clarify these relationships. Populations of *Lasmigona costata* in the Ozark Highlands represented a monophyletic clade strongly differentiated from populations east of the Mississippi River, suggesting the presence of at least one cryptic species within this taxon; additional investigation across the range of *L. costata* is needed to better understand these patterns (Hewitt et al. 2016). An endemic form of *Lasmigona* in the Barrens region of the upper Caney Fork drainage in Tennessee was recognized by Layzer et al. (1993), but the status of this putative taxon has not been evaluated further.

Lemiox *Rafinesque, 1831*.—Turgeon et al. (1998) recognized one species, *Lemiox rimosus*, and recent evidence supports no changes to this classification.

Leptodea *Rafinesque, 1820*.—Turgeon et al. (1998) recognized three species, and recent evidence supports no changes to this classification. Smith (2000) proposed moving *Leptodea ochracea* into the genus *Ligumia* based on mantle margin pigment and size of glochidia. We do not accept this proposal due to the limited number of taxa (four species in two genera) in that analysis, and we retain *ochracea* in *Leptodea*.

Lexingtonia *Ortmann, 1914*.—Turgeon et al. (1998) recognized two species. However, the type species, *Lexingtonia subplana*, was subsequently relegated to the synonymy of *Fusconaia masoni* based on Johnson (1970) and Bogan et al. (2003). As such, *Lexingtonia* is a junior synonym of *Fusconaia*. The other species recognized by Turgeon et al. (1998), *Lexingtonia dolabelloides*, did not group with *Fusconaia* in molecular analyses but formed a monophyletic clade with two other species (Campbell et al. 2005; Campbell and Lydeard 2012a, 2012b). *Pleuronaia* was resurrected by Williams et al. (2008) to accommodate this clade (see *Pleuronaia*).

Ligumia *Swainson, 1840*.—Turgeon et al. (1998) recognized three species. Subsequent molecular studies indicated the genus is not monophyletic, but further research is needed to fully elucidate these patterns (Campbell et al. 2005; Kuehnl 2009). We retain the classification of Turgeon et al. (1998), but as additional information becomes available taxa assigned to this genus will likely change (see Raley et al. 2007). Gangloff et al. (2013) identified a genetically divergent clade of *Ligumia recta* from the Mobile Basin that may warrant recognition as a distinct taxon.

Medionidus *Simpson, 1900*.—Turgeon et al. (1998) recognized seven species. We no longer recognize *Medionidus mcglameriae*, which was placed in the synonymy of *Leptodea fragilis* based on examination of the type specimen (Williams et al. 2008). Campbell et al. (2005) found some evidence for polyphyly of *Medionidus*, but this evidence was not conclusive and we make no other changes to this genus.

Megalonaias *Utterback, 1915*.—Turgeon et al. (1998) recognized one species, *Megalonaias nervosa*, and recent evidence supports no changes to this classification.

Obliquaria *Rafinesque, 1820*.—Turgeon et al. (1998) recognized one species, *Obliquaria reflexa*, and recent evidence supports no changes to this classification.

Obovaria *Rafinesque, 1819*.—Turgeon et al. (1998) recognized six species. Molecular data showed that *Obovaria* as depicted by Turgeon et al. (1998) is polyphyletic (Campbell et al. 2005). Notably, *Obovaria rotulata* was not a member of this group, and it was later reassigned to *Reginaia* (Campbell and Lydeard 2012b); we recognize this reassignment. In an analysis by Campbell et al. (2005), *O. olivaria* fell outside the clade containing other *Obovaria* and *Epioblasma*, but this conclusion was not consistently supported. We retain *olivaria* within *Obovaria*, but further work on this species is needed to resolve its generic assignment.

Evidence also supports reassignment to *Obovaria* of species recognized by Turgeon et al. (1998) under other genera. We reassign *Villosa arkansasensis* and *V. choctawensis* to *Obovaria* based on molecular data (Kuehnl 2009; Inoue et al. 2013) and marsupial morphology (Williams et al. 2011, for *choctawensis*). We also recognize reassignment of *Lampsilis haddletoni* to *Obovaria* based on shell morphology of the type lot (Williams et al. 2008, 2011), but this species is considered extinct and there are no available soft parts for anatomical or molecular study. *Obovaria jacksoniana* was recognized in Turgeon et al. (1998) but is synonymous with *Villosa arkansasensis* (Inoue et al. 2013). *Unio jacksoniana* Frierson, 1912, is a junior synonym of *Unio arkansasensis* Lea, 1862, and we place *O. jacksoniana* in the synonymy of *Obovaria arkansasensis*. There is also potential for unrecognized taxa within *O. arkansasensis* in central Gulf Slope drainages (Inoue et al. 2013).

In summary, we recognize seven species of *Obovaria*, including four species recognized by Turgeon et al. (1998) and three species reassigned from other genera, one from *Lampsilis* and two from *Villosa*.

Parvaspina *Perkins, Gangloff, and Johnson, 2017*.—*Parvaspina* was described subsequent to Turgeon et al. (1998) to accommodate a monophyletic clade of two species previously recognized as *Elliptio steinstansana* and *Pleurobema collina* (Perkins et al. 2017). We recognize these species as *Parvaspina steinstansana* and *Parvaspina collina*.

Pegias *Simpson, 1900*.—Turgeon et al. (1998) recognized one species, *Pegias fabula*, and recent evidence supports no changes to this classification.

Plectomerus *Conrad, 1853*.—Turgeon et al. (1998) recognized one species, *Plectomerus dombeyanus*, and recent evidence supports no changes to this classification.

Plethobasus *Simpson, 1900*.—Turgeon et al. (1998) recognized three species, and recent evidence supports no changes to this classification.

Pleurobema *Rafinesque, 1819*.—Turgeon et al. (1998) recognized 32 species, making it one of the largest unionid genera. Molecular data largely support the monophyly of *Pleurobema* as depicted by Turgeon et al. (1998) with two exceptions (Campbell et al. 2005, 2008; Campbell and Lydeard 2012b). These studies support reassignment of *P. collina* to *Parvaspina* and *P. gibberum* to *Pleuronaia* (Campbell et al. 2005, 2008; Campbell and Lydeard 2012b; see *Parvaspina* and *Pleuronaia*). However, Campbell et al. (2008) and Campbell and Lydeard (2012b) provided evidence that *Pleurobema* includes two distinct lineages, one including *P. sintoxia*, *P. cordatum*, *P. plenum*, *P. riddellii*, and *P. rubrum* and the other including all other species. Further research is needed to elucidate these relationships; we retain traditional use of *Pleurobema*.

Pleurobema rivals *Elliptio* in its large number of described species and the intractability of many species concepts, particularly in the Mobile Basin, but these problems are compounded for *Pleurobema* because many putative taxa are considered extinct. Based on a comprehensive comparison of shell type specimens and other available material, Williams et al. (2008) placed into synonymy nine species of Mobile Basin *Pleurobema* recognized by Turgeon et al. (1998): *P. chattanoogaense* (into *P. decisum*); *P. murrayense* (into *P. stabile*); *P. nucleopsis* and *P. troschelianum* (into *P. georgianum*); *P. flavidulum* and *P. johannis* (into *P. perovatum*); and *P. avellanum*, *P. furvum*, and *P. hagleri* (into *P. rubellum*). Some of these synonyms are further supported by molecular data (e.g., *P. chattanoogaense*, *P. furvum*; Campbell et al. 2008), and we recognize all of these changes. We do not recognize *Pleurobema altum* since it was deemed a nomen dubium because it is not identifiable due to incomplete description, vague type locality, and lack of type material (Williams et al. 2008). One Ohio River drainage species, *Pleurobema bournianum*, was placed into the synonymy of *Pleurobema clava* based on shell morphology (Watters et al. 2009), and we recognize this change.

We recognize four additional Mobile Basin species of *Pleurobema* not recognized by Turgeon et al. (1998). Williams et al. (2008) recognized three species based on examination of shell type specimens: *P. fibuloides*, *P. hartmanianum*, and *P. stabile*. We correct the spelling of *P. stabilis* as used by Williams et al. (2008) to *stabile* based on Lee (2008). *Pleurobema athearni* Gangloff, Williams, and Feminella, 2006, was described subsequent to Turgeon et al. (1998) based on morphological data (Gangloff et al. 2006). In addition, preliminary findings identified an undescribed species in the upper Tennessee River drainage (Schilling 2015).

In summary, we recognize 23 species of *Pleurobema*, including 19 species recognized by Turgeon et al. (1998), three species elevated from synonymy, and one newly described species.

Pleuronaia *Frierson, 1927*.—*Pleuronaia* was not included in Turgeon et al. (1998). This was the senior available name for a monophyletic clade of three species—*Fusconaia barnesiana*, *Lexingtonia dolabelloides*, and *Pleurobema gibberum*—identified in a molecular study by Campbell et al. (2005). We recognize resurrection of *Pleuronaia* to accommodate this group and reassignment of these three species to *Pleuronaia* as proposed previously (Williams et al. 2008; Campbell and Lydeard 2012a, 2012b). There are likely cryptic taxa of *Pleuronaia* in the upper Tennessee River drainage (Schilling 2015). We correct the gender agreement of the specific name of *Pleuronaia gibberum* to *gibber* (H. Lee, Jacksonville, Florida, personal communication).

Popenais *Frierson, 1927*.—Turgeon et al. (1998) recognized one species, *Popenais popeii*, and recent evidence supports no changes to this classification.

Potamilus *Rafinesque, 1818*.—Turgeon et al. (1998) recognized six species. One additional species, *Potamilus metnecktayi* Johnson, 1998, was described subsequently, and we recognize this species. *Potamilus inflatus* was referred to as the Inflated Heelsplitter by Turgeon et al. (1988) but was changed to Alabama Heelsplitter by Turgeon et al. (1998) without comment. Alabama Heelsplitter is the established common name for *Lasmigona alabamensis*, and we adopt the original common name Inflated Heelsplitter for *P. inflatus*. Roe and Lydeard (1998) found the Amite River population of *P. inflatus* to be genetically divergent, and it may warrant recognition as a distinct taxon.

Ptychobranchus *Simpson, 1900*.—Turgeon et al. (1998) recognized five species. *Ptychobranchus foremanianus* was elevated from the synonymy of *Ptychobranchus greenii* (in part) by Williams et al. (2008) based on shell morphology and periostracum color. A molecular analysis of this genus included insufficient material to resolve the relationship between these two taxa (Roe 2013), but we recognize both species. We correct the gender agreement of *Ptychobranchus subtentum* to *P. subtentus* following Lee (2008).

Pyganodon *Crosse and Fischer, 1894*.—Turgeon et al. (1998) recognized five species. Graf and Cummings (2007) without comment moved *Anodonta implicata* to *Pyganodon* and omitted *P. fragilis* and *P. lacustris*. However, molecular data demonstrated the validity of *P. fragilis* and *P. lacustris* (Doucet-Beaupré et al. 2012). Based on these results and the lack of justification for movement of *A. implicata* to *Pyganodon*, we retain the classification of Turgeon et al. (1998) for *Pyganodon*.

Quadrula *Rafinesque, 1820*.—Turgeon et al. (1998) recognized 18 species and two subspecies. Molecular studies generally supported the monophyly of *Quadrula* as depicted by Turgeon et al. (1998), but they also showed that it is composed of three deeply divergent monophyletic clades plus *Tritogonia verrucosa*, each of which warranted generic recognition (Serb et al. 2003; Campbell et al. 2005; Campbell and Lydeard 2012b). The type species for *Quadrula* is *Q. quadrula*, and the clade containing this species also includes *Q. apiculata*, *Q. fragosa*, *Q. nobilis*, and *Q. rumphiana*. *Quadrula nobilis* was elevated from synonymy based on shell morphology and unspecified genetic data (Howells et al. 1996) but not recognized by Turgeon et al. (1998). Relationships among species in the *Q. quadrula* group were not clearly resolved by Serb et al. (2003), but we recognize all five species. We also recognize within this group *Q. couchiana* on the basis of its shell morphology, which is similar to that of *Q. quadrula* (see *Cyclonaias*).

Based on molecular data, we reassign to *Cyclonaias* 10 taxa recognized by Turgeon et al. (1998) under *Quadrula*, and we reassign 5 species to *Theliderma* (Serb et al. 2003; Campbell et al. 2005; Campbell and Lydeard 2012b; see also Graf and Cummings 2007). We also synonymize two taxa recognized by Turgeon et al. (1998) under *Quadrula* (see *Theliderma*). In summary, we recognize six species of *Quadrula*, including five recognized under this genus by Turgeon et al. (1998) and one elevated from synonymy (*Q. nobilis*).

Quincuncina *Ortmann, 1922*.—Turgeon et al. (1998) recognized three species. Molecular data showed that the type species, *Quincuncina burkei*, belongs in *Fusconaia* (Lydeard et al. 2000; Serb et al. 2003; Campbell et al. 2005). As such, *Quincuncina* is a junior synonym of *Fusconaia*, and we reassign to this genus *Q. burkei* and *Q. mitchelli* (see also Pfeiffer et al. 2016). Based on these findings, we also reassign *Q. infucata* to *Cyclonaias* (see *Cyclonaias*).

Reginaia *Campbell and Lydeard, 2012*.—*Reginaia* was described subsequent to Turgeon et al. (1998) to accommodate a monophyletic clade of two species identified in a phylogenetic analysis of Ambleminae (Campbell and Lydeard 2012b). The two *Reginaia* species were included in Turgeon et al. (1998) as *Fusconaia ebena* and *Obovaria rotulata* (Campbell and Lydeard 2012b); we recognize assignment of these species to *Reginaia*. We follow Watters et al. (2009) in correcting the spelling of the species name *ebena* to *ebenus*. A third species, *Fusconaia apalachicola* Williams and Fradkin, 1999, was described subsequent to Turgeon et al. (1998) from archaeological material; we reassign this species to *Reginaia* based on its shell characters, which are similar to those of *R. ebenus* and *R. rotulata*.

Simpsonaias *Frierson, 1914*.—Turgeon et al. (1998) recognized one species, *Simpsonaias ambigua*, and recent evidence supports no changes to this classification.

Sinanodonta *Modell, 1945*.—*Sinanodonta* was not included in Turgeon et al. (1998). This genus was previously considered to be confined to Asia and not part of the North America fauna. Molecular data showed that *A. beringiana* is more closely related to the Asian species *Sinanodonta woodiana* than to other western North American *Anodonta* (Chong et al. 2008; see *Anodonta*). Based on this evidence, we reassign *beringiana* to *Sinanodonta*. In 2010 *S. woodiana*, Chinese Pondmussel, was found in Wickecheoke Creek, a tributary of the Delaware River, New Jersey (Bogan et al. 2011a). Several known glochidial host fishes, native and introduced species, occur in the watershed (Bogan et al. 2011b). The species appears to have become established in that stream despite eradication efforts (J. Bowers-Altman, New Jersey Division of Fish and Wildlife, personal communication). We recognize *S. woodiana* as established in New Jersey (Table 2). This is the only nonindigenous unionid mussel known to have become established in the United States or Canada.

Strophitus *Rafinesque, 1820*.—Turgeon et al. (1998) recognized three species, and recent evidence supports no changes to this classification. *Strophitus undulatus*, one of the most wide-ranging species in the United States and Canada, likely contains unrecognized cryptic taxa (Watters et al. 2009).

Theliderma *Swainson, 1840*.—*Theliderma* was not recognized by Turgeon et al. (1998). This genus was resurrected from synonymy by Graf and Cummings (2007) to accommodate a monophyletic clade of five species recognized by Turgeon et al. (1998) under *Quadrula* (*Q. cylindrica*, *Q. intermedia*, *Q. metanevra*, *Q. sparsa*, and *Q. stapes*; see Serb et al. 2003). *Theliderma* is the oldest available name for this clade and has *T. metanevra* as its type species. We recognize placement of all five of these species in *Theliderma*. No molecular data are available for *Theliderma stapes*, but its shell morphology is very similar to that of other *Theliderma*, and we include it in this genus following Graf and Cummings (2007).

Turgeon et al. (1998) recognized *Quadrula tuberosa*, but we place this taxon in the synonymy of *Theliderma metanevra* following Parmalee and Bogan (1998, as *Q. metanevra*). However, the relationship of *tuberosa* to other species is uncertain, and if it represents a valid species, it is considered extinct (see Haag and Cicerello 2016). *Quadrula cylindrica* was recognized in Turgeon et al. (1998) as containing two subspecies, *Theliderma cylindrica cylindrica* and *T. cylindrica strigillata*. These subspecies traditionally were distinguished from each other based on shell morphology and distribution, with *strigillata* being confined mainly to the upper Tennessee River system in Tennessee and Virginia (Parmalee and Bogan 1998). However, the distributional limits of *strigillata* have never been clearly defined as it grades into typical *T. c. cylindrica* in larger streams, suggesting that the shell forms represent ecophenotypic variation (Ortmann 1920), and molecular data provide no support for recognition of *T. c. strigillata* (Serb et al. 2003; Sproules et al. 2006). Based on this evidence, we do not recognize subspecies within *T. cylindrica*. Both *T. c. cylindrica* (threatened) and *T. c. strigillata* (endangered) are federally protected taxa. Synonymizing *strigillata* under *T. cylindrica* will not remove the protection provided by the Endangered Species Act but may impact the status of populations formerly recognized as *strigillata*.

Toxolasma *Rafinesque, 1831*.—Turgeon et al. (1998) recognized eight species. Recent evidence supports no changes at the genus level, but species boundaries within *Toxolasma* remain uncertain. Howells et al. (1996) placed *Toxolasma mearnsi* in the synonymy of *Toxolasma texasiense* based on electrophoretic analysis, a change overlooked by Turgeon et al. (1998); we recognize placement of *T. mearnsi* in the synonymy of *T. texasiense*. Undescribed species of *Toxolasma* have been recognized (e.g., Gulf Lilliput) but have yet to be formerly described (Williams et al. 2008, 2014).

Lee (2006) concluded that *Toxolasma* has a neuter gender, which necessitates correction of spellings from *lividus* to *lividum*, *parvus* to *parvum*, and *paulus* to *paulum*, without change to *corvunculus*, *cylindrellus*, or *pullus*; we recognize these spelling changes. Lee (2006) provided an incorrect spelling of *Toxolasma texasiense* (as *texasense*), but we correct it based on the spelling presented in the original description.

Tritogonia *Agassiz, 1852*.—Turgeon et al. (1998) recognized one species, *Tritogonia verrucosa*. Molecular data clearly supported inclusion of *T. verrucosa* within the tribe Quadrulini, but its placement within that group was unresolved, and Serb et al. (2003) recommended its placement within *Quadrula* (*sensu lato*) until relationships were better understood (e.g., see Williams et al. 2008; Haag and Cicerello 2016). Regardless of its relationship to other clades within the Quadrulini, *Tritogonia* represents a deeply divergent lineage (Serb et al. 2003; Campbell et al. 2012b), and our recognition of three other genera within this tribe (*Cyclonaias*, *Theliderma*, and *Quadrula* sensu stricto) warrants retention of *Tritogonia* as a monotypic genus (e.g., see Watters et al. 2009; Sietman et al. 2012).

Truncilla *Rafinesque, 1819*.—Turgeon et al. (1998) recognized four species, and recent evidence supports no changes to this classification.

Uniomerus *Conrad, 1853*.—Turgeon et al. (1998) recognized three species. Recent evidence supports no changes at the genus level, but species concepts within *Uniomerus* are uncertain (see Williams et al. 2008). *Uniomerus columbensis* was not recognized by Turgeon et al. (1998) but was elevated from synonymy by Williams et al. (2008) based on unpublished molecular data and shell morphology; we recognize this change. Species boundaries for other taxa (e.g., *Uniomerus declivis*) remain unresolved.

The inappropriate and misleading common name for *Uniomerus carolinianus*, Florida Pondhorn, was changed to Eastern Pondhorn by Williams et al. (2014) because the species occurs not only in Florida but northward along the Atlantic Coast; we recognize this change.

Utterbackia *Baker, 1927*.—Turgeon et al. (1998) recognized three species and recent evidence supports no changes to this classification.

Utterbackiana *Frierson, 1927*.—*Utterbackiana* was not recognized by Turgeon et al. (1998). We resurrect this genus as the senior available name for a monophyletic clade of four eastern North American species included in Turgeon et al. (1998) under *Anodonta* (*A. couperiana*, *A. heardi*, *A. implicata*, and *A. suborbiculata*; Mock et al. 2004; Zanatta et al. 2007; see *Anodonta*). The type species for the genus is *Anodonta suborbiculata* Say, 1831. In addition to the four taxa mentioned above, a new species was described subsequent to Turgeon et al. (1998), *Anodonta hartfieldorum* (Williams et al. 2009). We also place this species in *Utterbackiana* because it appears closely related to *U. suborbiculata* and was formerly associated with that species.

Venustaconcha *Frierson, 1927*.—Turgeon et al. (1998) recognized two species. Molecular data showed that *Villosa perpurpurea* and *Villosa trabalis* also are members of *Venustaconcha* (Kuehnl 2009; Lane et al. 2016). Molecular data further showed that *Venustaconcha perpurpurea* is a junior synonym of *Venustaconcha trabalis*, and populations of this species in the Tennessee River drainage are genetically and morphologically distinct from those in the Cumberland River drainage (Lane et al. 2016). Based on the type locality of *trabalis*, Flint River, Alabama, this name is applicable to the Tennessee River drainage species. *Unio troostensis* Lea, 1834, is the oldest available name for the Cumberland drainage species (type locality is Stones River, Tennessee), and we recognize this species as *Venustaconcha troostensis* (see Haag and Cicerello 2016; Lane et al. 2016). Cumberland Bean was the common name used for *V. trabalis* by Turgeon et al. (1998), but Lane et al. (2016) proposed Tennessee Bean for *Venustaconcha trabalis* and Cumberland Bean for *Venustaconcha troostensis*; we follow this use. *Venustaconcha sima* was not included in Turgeon et al. (1998) but was elevated from synonymy by Gordon (1995) based on shell coloration and conchological characters, and its distinctiveness is supported by molecular data (Kuehnl 2009). This species was synonymized under *Villosa iris* by Parmalee and Bogan (1998), and molecular data support its relationship to *Villosa* (Kuehnl 2009). We recognize *sima* as a species of *Villosa*.

Villosa *Frierson, 1927*.—Turgeon et al. (1998) recognized 17 species and one subspecies. Molecular data show that *Villosa*, as depicted by Turgeon et al. (1998), is wildly polyphyletic, with species occurring in as many as seven different clades within the Lampsilini (Kuehnl 2009). These and other data support reassignment of *Villosa trabalis* to *Venustaconcha*, synonymization of *Villosa perpurpurea* under *Venustachoncha trabalis* (see *Venustaconcha*), and reassignment of *Villosa choctawensis* and *V. arkansasensis* to *Obovaria* (see *Obovaria*). Most other species will require reassignment to existing genera (e.g., *V. vaughniana* to *Ligumia*; Raley et al. 2007; Kuehnl 2009) or resurrected or newly described genera, potentially with only *Villosa amygdala* and *V. villosa* remaining in *Villosa* (Kuehnl 2009). However, these relationships are not fully understood, and currently synonymized or newly described generic names have not been proposed. With the exception of *Villosa trabalis*, *V. perpurpurea*, *V. choctawensis*, and *V. arkansasensis*, we retain all other species recognized by Turgeon et al. (1998) in *Villosa*.

Villosa vanuxemensis umbrans was elevated to species status by Williams et al. (2008) based on shell characters and preliminary molecular data, and subsequent molecular data support this change (Kuehnl 2009); based on this evidence, we recognize *V. umbrans*. There are several undescribed taxa within *Villosa* (Kuehnl 2009; Harris et al. 2009). We recognize correction of gender agreement for *Villosa amygdala*, as given by Turgeon et al. (1998), to *Villosa amygdalum* following Williams et al. (2011, 2014). We recognize fifteen species of *Villosa*.

DISCUSSION

Changes in mussel taxonomy compared to Turgeon et al. (1998) reflect our better understanding of mussel phylogenetic relationships obtained mainly from molecular genetic data (e.g., Serb et al. 2003; Campbell and Lydeard 2012a, 2012b; Inoue et al. 2013, 2014; Pfeiffer et al. 2016). Molecular genetics continues to be one of the most important tools for understanding unionoid relationships and taxonomy, but other data sets (e.g., life history, host use, soft anatomy, shell morphology, zoogeography) are informative and should not be overlooked when constructing phylogenies and conducting taxonomic studies (e.g., Roe et al. 2001; Jones and Neves 2010; Lane et al. 2016).

We recognize a larger number of genera than Turgeon et al. (1998; 56 vs. 49), but the number of currently recognized species is similar. However, recent studies show that considerable cryptic biodiversity exists in the Unionidae (e.g., *Cyprogenia*, *Lampsilis*, *Villosa*). Most of this biodiversity remains to be discovered, and its future recognition may result in increased numbers of species in the United States and Canada (see Haag 2012). Currently unrecognized species may be narrowly distributed (e.g., one river system) and in need of conservation measures. Development of additional molecular markers, more inclusive taxon sampling, advancements in phylogenetic analyses, and other techniques for species delineation are facilitating taxonomic recognition of species. More thorough understanding of life histories with improved husbandry techniques should also help facilitate species recognition.

Future research will most likely reveal unrecognized taxa. Conversely, additional synonymy may be warranted for some currently recognized species. Much more research is needed to delineate true diversity of the mussels of the United States and Canada.

ACKNOWLEDGMENTS

We thank the following individuals who were always very responsive to our questions regarding names of freshwater mussels: John Alderman, Gerry Dinkins, Mike Gangloff, Dan Graf, Jordan Holcomb, Bob Howells, Sarina Jepsen, Paul Johnson, Stephen McMurray, Terry Myers, Charles Randklev, Kevin Roe, Tim Savidge, Daniel Schilling, Brian Watson, and Jason Wisniewski. We acknowledge Harry G. Lee (Jacksonville, Florida) for providing expert advice on the proper terminations for numerous species names. We also thank Sherry L. Bostick for assistance in preparation and review of several drafts of the manuscript. Although the individuals mentioned here provided assistance and input, we bear full responsibility for any errors. The findings and conclusions in this article are those of the authors and do not necessarily represent the views of their agencies and institutions. Any use of trade, firm, or product names is for descriptive purposes only and does not imply endorsement by the U.S. Government.

LITERATURE CITED

Ahlstedt, S. A., M. T. Fagg, R. S. Butler, J. F. Connell, and J. W. Jones. 2016. Quantitative monitoring of freshwater mussel populations from 1979–2004 in the Clinch and Powell Rivers of Tennessee and Virginia, with miscellaneous notes on the fauna. Freshwater Mollusk Biology and Conservation 19:1–18.

Araujo, R., S. Schneider, K. J. Roe, D. Erpenbeck, and A. Machrodom. 2017. The origin and phylogeny of Margaritiferidae (Bivalvia, Unionoida): A synthesis of molecular and fossil data. Zoologica Stripta 46:289–307. doi: 10.1111/zsc.12217

Arizona Game and Fish Department. 2017. Heritage data management system. *Anodonta californiensis*, California Floater. Available at http://www.azgfd.gov/pdfs/w_c/hdms/Invertibrates/Anodcali.fo.pdf (accessed June 15, 2017).

Bequaert, J. C., and W. B. Miller. 1973. The Mollusks of the Arid Southwest, with an Arizona Check List. The University of Arizona Press, Tucson. 271 pp.

Bieler, R., J. G. Carter, and E. V. Coan. 2010. Classification of bivalve families. Pages 113–133 *in* P. Bouchet, J.-P. Rocroi, Rüdiger Bieler, J. G. Carter, and E. V. Coan, editors. Nomenclator of Bivalve Families with a Classification of Bivalve Families. Malacologia 52:1–184.

Bogan, A. E., J. Bowers-Altman, and M. E. Raley. 2011a. A new threat to conservation of North American freshwater mussels: Chinese Pond Mussel *Sinanodonta woodiana* in the United States. Tentacle 19:39–40.

Bogan, A. E., J. Bowers-Altman, and M. E. Raley. 2011b. The first confirmed record of the Chinese Pond Mussel (*Sinanodonta woodiana*) (Bivalvia: Unionidae) in the United States. The Nautilus 125:41–43.

Bogan, A. E., and M. E. Raley. 2013. Taxonomic status of the Cumberland Papershell, *Anodontoides argenteus* (Lea, 1840) [formerly *Anodontoides denigrata* (Lea, 1852)] (Mollusca: Bivalvia: Unionidae). Unpublished report submitted to U.S. Fish and Wildlife Service, Frankfort, Kentucky. 32 pp.

Bogan, A. E., M. Raley, and J. Levine. 2003. Determination of the systematic position and relationships of the Atlantic Pigtoe, *Fusconaia masoni* (Conrad, 1834) (Mollusca: Bivalvia: Unionidae) with distributions in Virginia, North and South Carolina, and Georgia. Unpublished report submitted to U.S. Fish and Wildlife Service, Asheville, North Carolina. 14 pp.

Bolotov, I. N., Y. V. Bespalaya, I. V. Vikhrev, O. V. Aksenova, P. E. Aspholm, M. Y. Gofarov, O. K. Klishko, Y. S. Kolosova, A. V. Kondakov, A. A. Lyubas, I. S. Paltser, E. S. Konopleva, S. Tumpeesuwan, N. N. Bolotov, and I. S. Voroshilova. 2015. Taxonomy and distribution of the freshwater pearl mussels (Unionoida: Margaritiferidae) in the Far East of Russia. PLoS ONE 10:e0122408. doi: 10.1371/journal.pone.0122408

Bolotov, I. N., I. V. Vikhrev, Y. V. Bespalaya, M. Y. Gofarov, A. V. Kondakov, E. S. Konopleva, N. N. Bolotov, and A. A. Lyubas. 2016. Multi-locus fossil-calibrated phylogeny, biogeography and a subgeneric revision of the Margaritiferidae (Mollusca: Bivalvia: Unionoida). Molecular Phylogenetics and Evolution 103:104–121.

Brim Box, J., and J. D. Williams. 2000. Unionid mollusks of the Apalachicola Basin in Alabama, Florida, and Georgia. Alabama Museum of Natural History Bulletin 21:1–143.

Burch, J. B. 1973. Freshwater unionacean clams (Mollusca: Pelecypoda) of North America. Biota of Freshwater Ecosystems. Identification Manual 11, U.S. Environmental Protection Agency, Washington, D.C. 176 pp.

Burch, J. B. 1975. Freshwater unionacean clams (Mollusca: Pelecypoda) of North America. Revised edition. Malacological Publications, Hamburg, Michigan. 204 pp.

Burlakova, L. E., D. Campbell, A. Y. Karatayev, and D. Barclay. 2012. Distribution, genetic analysis and conservation priorities for rare Texas freshwater molluscs in the genera *Fusconaia* and *Pleurobema* (Bivalvia: Unionidae). Aquatic Biosystems 8:1–15.

Campbell, D. C., P. D. Johnson, J. D. Williams, A. K. Rindsberg, J. M. Serb, K. K. Small, and C. Lydeard. 2008. Identification of 'extinct' freshwater mussel species using DNA barcoding. Molecular Ecology Resources 8:711–724. doi: 10.1111/j.1755-0998.2008.02108.x

Campbell, D. C., and C. Lydeard. 2012a. Molecular systematics of *Fusconaia* (Bivalvia: Unionidae: Ambleminae). American Malacological Bulletin 30:1–17.

Campbell, D. C., and C. Lydeard. 2012b. The genera of Pleurobemini (Bivalvia: Unionidae: Ambleminae). American Malacological Bulletin 30:19–38.

Campbell, D. C., J. M. Serb, J. E. Buhay, K. J. Roe, R. L. Minton, and C. Lydeard. 2005. Phylogeny of North American amblemines (Bivalvia, Unionoida): Prodigious polyphyly proves pervasive across genera. Invertebrate Biology 124:131–164.

Carter, J. G., C. R. Altaba, L. C. Anderson, R. Araujo, A. S. Biakov, A. E. Bogan, D. C. Campbell, M. Campbell, C. Jin-hua, J. C. W. Cope, G. Delvene, H. H. Dijkstra, F. Zong-jie, R. N. Gardner, V. A. Gavrilova, I. A. Goncharova, P. J. Harries, J. H. Hartman, M. Hautmann, W. R. Hoeh, J. Hylleberg, J. Bao-yu, P. Johnston, L. Kirkendale, K. Kleemann, J. Koppka, J. Kříž, D. Machado, N. Malchus, A. Márquez-Aliaga, J.-P. Masse, C. A. McRoberts, P. U. Middelfart, S. Mitchell, L. A. Nevesskaja, S. Özer, J. Pojeta, Jr., I. V. Polubotko, J. M. Pons, S. Popov, T. Sánchez, A. F. Sartori, R. W. Scott, I. I. Sey, J. H. Signorelli, V. V. Silantiev, P. W. Skelton, T. Steuber, J. B. Waterhouse, G. L. Wingard, and T. Yancey. 2011. A synoptical classification of the Bivalvia (Mollusca). Paleontological Contributions No. 4. Kansas University Paleontological Institute. The University of Kansas, Lawrence. 47 pp.

Chong, J. P., J. C. Brim Box, J. K. Howard, D. Wolf, T. L. Myers, and K. E. Mock. 2008. Three deeply divided lineages of the freshwater mussel genus *Anodonta* in western North America. Conservation Genetics 9:1303–1309.

Chong, J. P., J. L. Harris, and K. J. Roe. 2016. Incongruence between mtDNA and nuclear data in the freshwater mussel genus *Cyprogenia* (Bivalvia: Unionidae) and its impact on species delineation. Ecology and Evolution 6:2439–2452. doi: 10.1002/ece3.2071

Cicerello, R. R., and G. A. Schuster. 2003. A guide to the freshwater mussels of Kentucky. Kentucky State Nature Preserves Commission, Scientific and Technical Series, No. 7. 62 pp.

Clarke, A. H. 1981. The tribe Alasmidontini (Unionidae: Anodontinae). Part I: *Pegias*, *Alasmidonta*, and *Arcidens*. Smithsonian Contributions to Zoology, No. 326. 101 pp.

Clarke, A. H. 1992. Brief communications. Malacology Data Net 3:98.

Clench, W. J., and R. D. Turner. 1956. Freshwater mollusks of Alabama, Georgia, and Florida from the Escambia to the Suwannee River. Bulletin of the Florida State Museum, Biological Sciences 1:97–239, plates 1–9.

Combosch, D. J., T. M. Collins, E. A. Glover, D. L. Graf, E. M. Harper, J. M. Healy, G. Y. Kawauchi, S. Lemer, E. McIntyre, E. E. Strong, J. D. Taylor, J. D. Zardus, P. M. Mikkelsen, G. Giribet, and R. Bieler. 2017. A family-level Tree of Life for bivalves based on a Sanger-sequencing approach. Molecular Phylogenetics and Evolution 107:191–208.

Cummings, K. S., and J. M. K. Berlocher. 1990. The naiades or freshwater mussels (Bivalvia: Unionidae) of the Tippecanoe River, Indiana. Malacological Review 23:83–98.

Cummings, K. S., and D. L. Graf. 2010. Mollusca: Bivalvia. Pages 309–384 *in* J. H. Thorp and A. P. Covich, editors. Ecology and Classification of North American Freshwater Invertebrates. 3rd ed. Elsevier, Amsterdam, The Netherlands.

Davis, G. M., and S. L. H. Fuller. 1981. Genetic relationships among Recent Unionacea (Bivalvia) of North America. Malacologia 20:217–253.

Davis, G. M., and P. Mulvey. 1993. Species status of Mill Creek *Elliptio*. Savannah River Plant National Environment Research Park, SRO–NERP 22:4–58.

Doucet-Beaupré, H., P. U. Blier, E. G. Chapman, H. Piontkivska, F. Dufresne, B. E. Sietman, R. S. Mulcrone, and W. R. Hoeh. 2012. *Pyganodon* (Bivalvia: Unionoida: Unionidae) phylogenetics: A male- and female-transmitted mitochondrial DNA perspective. Molecular Phylogenetics and Evolution 63:430–444.

Elderkin, C. L., A. D. Christian, J. L. Metcalfe-Smith, and D. J. Berg. 2008. Population genetics and phylogeography of freshwater mussels in North America, *Elliptio dilatata* and *Actinonaias ligamentina* (Bivalvia: Unionidae). Molecular Ecology 17:2149–2163.

Frierson, L. S. 1927. A Classification and Annotated Check List of the North American Naiades. Baylor University Press, Waco, Texas. 111 pp. Errata et Corrigenda.

Gangloff, M. M., B. A. Hamstead, E. F. Abernethy, and P. D. Hartfield. 2013. Genetic distinctiveness of *Ligumia recta*, the Black Sandshell, in the Mobile River Basin and implications for its conservation. Conservation Genetics 14:913–916. doi: 10.1007/s10592-013-0480-0

Gangloff, M. M., J. D. Williams, and J. W. Feminella. 2006. A new species of freshwater mussel (Bivalvia: Unionidae), *Pleurobema athearni*, from the Coosa River drainage of Alabama, USA. Zootaxa 1118:43–56.

Gilbert, C. R. 1961. Hybridization versus intergradation: An inquiry into the relationship of two cyprinid fishes. Copeia 1961:181–192.

Gordon, M. E. 1995. *Venustaconcha sima* (Lea), an overlooked freshwater mussel (Bivalvia: Unionoidea) from the Cumberland River basin of central Tennessee. The Nautilus 108:55–60.

Graf, D. L. 2002. Molecular phylogenetic analysis of two problematic freshwater mussel genera (*Unio* and *Gonidea*) and a re-evaluation of the classification of Nearctic Unionidae (Bivalvia: Palaeoheterodonta: Unionoida). Journal of Molluscan Studies 68:65–71.

Graf, D. L., and K. S. Cummings. 2007. Review of the systematics and global diversity of freshwater mussel species (Bivalvia: Unionoida). Journal of Molluscan Studies 73:291–314.

Graf, D. L., and K. S. Cummings. 2017. The freshwater mussels (Unionoida) of the world (and other less consequential bivalves). MUSSELp database. Available at http://mussel-project.uwsp.edu/db/ (accessed March 25, 2017).

Graf, D. L., and D. Ó Foighill. 2000. The evolution of brooding characters among the freshwater pearly mussels (Bivalvia: Unionoidea) of North America. Journal of Molluscan Studies 66:157–170.

Grobler, J. P., J. W. Jones, N. A. Johnson, R. J. Neves, and E. M. Hallerman. 2011. Homogeneity at nuclear microsatellite loci masks mitochondrial haplotype diversity in the endangered Fanshell Pearlymussel (*Cyprogenia stegaria*). Journal of Heredity 102:196–206.

Haag, W. R. 2012. North American Freshwater Mussels: Natural History, Ecology, and Conservation. Cambridge University Press, New York. 505 pp.

Haag, W. R., and R. R. Cicerello. 2016. A distributional atlas of the freshwater mussels of Kentucky. Scientific and Technical Series 8. Kentucky State Nature Preserves Commission, Frankfort. 299 pp.

Harris, J. L., W. R. Hoeh, A. D. Christian, J. Walker, J. L. Farris, R. L. Johnson, and M. E. Gordon. 2004. Species limits and phylogeography of Lampsilinae (Bivalvia; Unionoida) in Arkansas with emphasis on species of *Lampsilis*. Unpublished final report to Arkansas Game and Fish Commission and U.S. Fish and Wildlife Service. 70 pp, 10 plates.

Harris, J. L., W. R. Posey, 2nd, C. L. Davidson, J. L. Farris, S. R. Oetker, J. N. Stoeckel, M. G. Crump, S. Barnett, H. C. Martin, J. H. Seagraves, N. J. Wentz, R. Winterringer, C. Osborne, and A. D. Christian. 2009. Unionoida (Mollusca: Margaritiferidae, Unionidae) in Arkansas, third status review. Journal of the Arkansas Academy of Science 63:50–86.

Heard, W. H., and R. H. Guckert. 1971. A re-evaluation of the Recent Unionacea (Pelecypoda) of North America. Malacologia 10:333–355.

Herrmannsen, A. N. 1848. Indicis generum Malacozoorum primordia. Nomina subgenerum, familiarum, tribuum, ordinum, classium; adjectis auctoribus, temporibus, locis systematicis atque literariis, etymis, synonymis. Praetermittuntur Cirripedia, Tunicata et Rhizopoda. 2:353–492.

Hewitt, T. L., J. L. Bergner, D. A. Woolnough, and D. T. Zanatta. 2016. Phylogeography of the freshwater mussel species *Lasmigona costata*: Testing post-glacial colonization hypotheses. Hydrobiologia. doi: 10.1007/s10750-016-2834-3

Hoeh, W. R., A. E. Bogan, K. S. Cummings, and S. I. Guttman. 2002. Evolutionary relationships among the higher taxa of freshwater mussels (Bivalvia: Unionoida): Inferences on phylogeny and character evolution from analyses of DNA sequence data. Malacological Review 31–32:123–141.

Hoeh, W. R., A. E. Bogan, and W. H. Heard. 2001. A phylogenetic perspective on the evolution of morphological and reproductive characteristics in the Unionoida. Pages 257–280 *in* G. Bauer and K. Wächtler, editors. Ecology and Evolution of the Freshwater Mussels Unionoida. Ecological Studies, Vol. 145. Springer-Verlag, Berlin.

Hoeh, W. R., A. E. Bogan, W. H. Heard, and E. G. Chapman. 2009. Palaeoheterodont phylogeny, character evolution, diversity and phylogenetic classification: A reflection on methods of analysis. Malacologia 51:307–317.

Howells, R. G., R. W. Neck, and H. D. Murray. 1996. Freshwater Mussels of Texas. Texas Parks and Wildlife Department, Inland Fisheries Division, Austin. 218 pp.

Huang, J., and L. L. Knowles. 2016. The species versus subspecies conundrum: Quantitative delimitation from integrating multiple data types within a single Bayesian approach in Hercules Beetles. Systematic Biology 65:685–699.

Huff, S. W., D. Campbell, D. L. Gustafson, C. Lydeard, C. R. Altaba, and G. Giribet 2004. Investigations into the phylogenetic relationships of freshwater pearl mussels (Bivalvia: Margaritiferidae) based on molecular data: Implications for their taxonomy and biogeography. Journal of Molluscan Studies 70:379–388.

Inoue, K., D. M. Hayes, J. L. Harris, and A. D. Christian. 2013. Phylogenetic and morphometric analyses reveal ecophenotypic plasticity in freshwater mussels *Obovaria jacksoniana* and *Villosa arkansasensis* (Bivalvia: Unionidae). Ecology and Evolution 3:2670–2683.

Inoue, K., A. L. McQueen, J. L. Harris, and D. J. Berg. 2014. Molecular phylogenetics and morphological variation reveal recent speciation in freshwater mussels of the genera *Arcidens* and *Arkansia* (Bivalvia: Unionidae). Biological Journal of the Linnean Society 112:535–545.

Johnson, R. I. 1970. The systematics and zoogeography of the Unionidae (Mollusca: Bivalvia) of the southern Atlantic Slope Region. Bulletin of the Museum of Comparative Zoology 140:263–449.

Johnson, R. I. 1998. A new mussel, *Potamilis metnecktayi* (Bivalvia: Unionidae), from the Rio Grande system, Mexico and Texas with notes on Mexican *Disconaias*. Occasional Papers on Mollusks 5:427–455, plates 22–27.

Jones, J. W., and R. J. Neves. 2010. Descriptions of a new species and a new subspecies of freshwater mussels, *Epioblasma ahlstedti* and *Epioblasma florentina aureola* (Bivalvia: Unionidae), in the Tennessee River drainage, USA. The Nautilus 124:77–92.

Jones, J. W., R. J. Neves, S. A. Ahlstedt, and E. M. Hallerman. 2006. A holistic approach to taxonomic evaluation of two closely related endangered freshwater mussel species, the Oyster Mussel *Epioblasma capsaeformis* and Tan Riffleshell *Epioblasma florentina walkeri* (Bivalvia: Unionidae). Journal of Molluscan Studies 72:267–283. doi: 10.1093/mollus/eyl004

King, T. L., M. S. Eackles, B. Gjetvaj, and W. R. Hoeh. 1999. Intraspecific phylogeography of *Lasmigona subviridis* (Bivalvia: Unionidae): Conservation implications of range discontinuity. Molecular Ecology 8:S65–S78.

Kuehnl, K. F. 2009. Exploring levels of genetic variation in the freshwater mussel genus *Villosa* (Bivalvia: Unionidae) at different spatial and systematic scales: Implications for biogeography, taxonomy, and conservation. Doctoral dissertation, The Ohio State University, Columbus.

Lane, T. W., E. M. Hallerman, and J. W. Jones. 2016. Phylogenetic and taxonomic assessment of the endangered Cumberland Bean, *Villosa trabalis* and Purple Bean, *Villosa perpurpurea* (Bivalvia: Unionidae). Conservation Genetics 17:1109–1124. doi: 10.1007/s10592-016-0847-0

Layzer, J. B., M. E. Gordon, and R. M. Anderson. 1993. Mussels: The forgotten fauna of regulated rivers. A case study of the Caney Fork River. Regulated Rivers: Research and Management 8:63–71.

Lee, H. G. 2006. Musings on a local specimen of *Toxolasma paulum* (I. Lea, 1840), the Iridescent Lilliput. Shell-O-Gram 47:3–6.

Lee, H. G. 2008. Book review: Freshwater Mussels of Alabama and the Mobile Basin in Georgia, Mississippi and Tennessee. The Nautilus 122:261–263.

Lopes-Lima, M., E. Froufe, V. T. Do, M. Ghamizi, K. E. Mock, U. Kebapci, O. Klishko, S. Kovitvadhi, U. Kovitvadhi, O. S. Paul, J. M. Pfeiffer, 3rd, M. Raley, N. Riccardi, H. Sereflisan, R. Sousa, A. Teirxeira, S. Varandas, X. P. Wu, D. T. Zanatta, A. Zieritz, and A. E. Bogan. 2017. Phylogeny of the most species rich freshwater bivalve family (Bivalvia: Unionida: Unionidae): Defining modern subfamilies and tribes. Molecular Phylogeny and Evolution 106:174–191. Available at http://dx.doi.org/10.1016/j.ympev.2016.08.021

Lydeard, C., R. L. Minton, and J. D. Williams. 2000. Prodigious polyphyly in imperiled freshwater pearly-mussels (Bivalvia: Unionidae): A phylogenetic test of species and generic designations. Pages 145–158 *in* E. M. Harper, J. D. Taylor, and J. A. Crane, editors. The Evolutionary Biology of the Bivalvia. Geological Society Special Publication, No. 177.

Mayr, E., E. G. Linsley, and R. L. Usinger. 1953. Methods and Principles of Systematic Zoology. McGraw-Hill, New York. 336 pp.

McCartney, M. A., A. E. Bogan, K. M. Sommer, and A. E. Wilbur. 2016. Phylogenetic analysis of Lake Waccamaw freshwater mussel species. American Malacological Bulletin 34:109–120.

McMurray, S. E., J. S. Faiman, A. Roberts, B. Simmons, and M. C. Barnhart. 2012. A guide to Missouri's freshwater mussels. Missouri Department of Conservation, Jefferson City. 94 pp.

Miller, R. R., W. L. Minckley, and S. M. Norris. 2005. Freshwater Fishes of México. University of Chicago Press, Chicago, Illinois. 490 pp.

Mock, K. E., J. C. Brim Box, M. P. Miller, M. E. Downing, and W. R. Hoeh. 2004. Genetic diversity and divergence among freshwater mussel

(*Anodonta*) populations in the Bonneville Basin of Utah. Molecular Ecology 13:1085–1098.

Modell, H. 1964. Das natürliche system der Najaden. 3. Archiv für Molluskenkunde 93:71–126.

Morrison, J. P. E. 1942. Preliminary report on mollusks found in the shell mounds of the Pickwick Landing Basin in the Tennessee River Valley. Pages 337–392 *in* W. S. Webb and D. L. DeJarnette, editors. An archaeological survey of Pickwick Basin in the adjacent portions of the states of Alabama, Mississippi and Tennessee. Bureau of American Ethnology, Bulletin 129.

Neves, R. J., A. E. Bogan, J. D. Williams, S. A. Ahlstedt, and P. W. Hartfield. 1997. Status of aquatic mollusks in the southeastern United States: A downward spiral of diversity. Pages 43–85 *in* G. A. Benz and D. E. Collins, editors. Aquatic Fauna in Peril: The Southeastern Perspective. Special Publication No. 1, Southeast Aquatic Research Institute. Lenz Design & Communications, Decatur, Georgia.

Ortmann, A. E. 1918. The nayades (freshwater mussels) of the upper Tennessee drainage. With notes on synonymy and distribution. Proceedings of the American Philosophical Society 57:521–626.

Ortmann, A. E. 1920. Correlation of shape and station in freshwater mussels (Naiades). Proceedings of the American Philosophical Society 59:269–312.

Parmalee, P. W., and A. E. Bogan. 1998. The Freshwater Mussels of Tennessee. The University of Tennessee Press, Knoxville. 328 pp.

Perkins, M. A., N. A. Johnson, and M. M. Gangloff. 2017. Molecular systematics of the critically-endangered North American spinymussels (Unionidae: *Elliptio* and *Pleurobema*) and description of *Parvaspina* gen. nov. Conservation Genetics 18:745–757. doi: 10.1007/s10592-017-0924-z

Pfeiffer, J. M., 3rd, N. A. Johnson, C. R. Randklev, R. G. Howells, and J. D. Williams. 2016. Generic reclassification and species boundaries in the rediscovered freshwater mussel “*Quadrula*” *mitchelli* (Simpson in Dall, 1896). Conservation Genetics 17:279–292. doi: 0.1007/s10592-015-0780-7

Raley, M. E., A. E. Bogan, C. B. Eads, and J. F. Levine. 2007. Molecular evidence for a novel placement of the Carolina Creekshell, *Villosa vaughaniana* (Lea, 1836). Page 41 *in* Freshwater Mollusk Conservation Society Symposium, Little Rock, Arkansas.

Roe, K. J. 2013. Molecular phylogenetics and zoogeography of the freshwater mussel genus *Ptychobranchus* (Bivalvia: Unionidae). Bulletin of the American Malacological Society 31:257–265.

Roe, K. J., and P. D. Hartfield. 2005. *Hamiota*, a new genus of freshwater mussel (Bivalvia: Unionidae) from the Gulf of Mexico drainages of the southeastern United States. The Nautilus 119:1–10.

Roe, K. J., P. D. Hartfield, and C. Lydeard. 2001. Phylogenetic analysis of the threatened and endangered superconglutinate-producing mussels of the genus *Lampsilis* (Bivalvia: Unionidae). Molecular Ecology 10:2225–2234.

Roe, K. J., and W. R. Hoeh. 2003. Systematics of freshwater mussels (Bivalvia: Unionoida). Pages 91–122 *in* C. Lydeard and D. R. Lindberg, editors. Molecular Systematics and Phylogeography of Mollusks. Smithsonian Books, Washington, D.C.

Roe, K. J., and C. Lydeard. 1998. Species delineation and the identification of evolutionarily significant units: Lessons from the freshwater mussel genus *Potamilus* (Bivalvia: Unionidae). Journal of Shellfish Research 17:1359–1363.

Schilling, D. E. 2015. Assessment of morphological and molecular genetic variation of freshwater mussel species belonging to the genera *Fusconaia*, *Pleurobema*, and *Pleuronaia* in the upper Tennessee River basin. Master’s thesis, Virginia Polytechnic Institute and State University, Blacksburg.

Serb, J. M., and M. C. Barnhart. 2008. Congruence and conflict between molecular and reproductive characters when assessing biological diversity in the Western Fanshell *Cyprogenia aberti* (Bivalvia, Unionidae). Annals of the Missouri Botanical Garden 95:248–261.

Serb, J. M., J. E. Buhay, and C. Lydeard. 2003. Molecular systematics of the North American freshwater bivalve genus *Quadrula* (Unionidae: Ambleminae) based on mitochondrial ND1 sequences. Molecular Phylogenetics and Evolution 28:1–11.

Sietman, B. E., J. M. Davis, and M. C. Hove. 2012. Mantle display and glochidia release behaviors of five quadruline freshwater mussel species (Bivalvia: Unionidae). American Malacological Bulletin 30:39–46.

Smith, D. G. 2000. On the taxonomic placement of *Unio ochraceus* Say, 1817 in the genus *Ligumia* (Bivalvia: Unionidae). The Nautilus 114:115–160.

Smith, D. G. 2001. Systematics and distribution of the recent Margaritiferidae. Pages 33–49 *in* G. Bauer and K. Wächtler, editors. Ecology and Evolution of Freshwater Mussels Unionoida. Ecological Studies, Vol. 145. Springer-Verlag, Berlin.

Sproules, J., P. Grobler, N. Johnson, J. W. Jones, R. J. Neves, and E. M. Hallerman. 2006. Genetic analysis of selected populations of the Rabbitsfoot Pearlymussel (*Quadrula cylindrica cylindrica*) (Bivalvia: Unionidae). Unpublished final report submitted to U.S. Fish and Wildlife Service, Frankfort, Kentucky. 16 pp.

Stiven, A. E., and J. Alderman. 1992. Genetic similarities among certain freshwater mussel populations of the *Lampsilis* genus in North Carolina. Malacologia 34:355–369.

Turgeon, D. D., A. E. Bogan, E. V. Coan, W. K. Emerson, W. G. Lyons, W. L. Pratt, C. F. E. Roper, A. Scheltema, F. G. Thompson, and J. D. Williams. 1988. Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks. American Fisheries Society, Special Publication 16. 277 pp., 12 plates.

Turgeon, D. D., J. F. Quinn, A. E. Bogan, E. V. Coan, F. G. Hochberg, W. G. Lyons, P. Mikkelsen, R. J. Neves, C. F. E. Roper, G. Rosenberg, B. Roth, A. Scheltema, F. G. Thompson, M. Vecchione, and J. D. Williams. 1998. Common and Scientific Names of Aquatic Invertebrates from the United States and Canada: Mollusks, 2nd ed. American Fisheries Society, Special Publication 26. 526 pp.

Valenciennes, A. 1827. Coquilles fluviatiles bivalves du Nouveau-Continent, recueillies pendant le voyage de MM. De Humboldt et Bonpland. *In* A. von Humboldt and A. J. A. Bonpland, editors. Recueil d’observations de zoologie et d’anatomie compare, faites dans l’ocean Atlantique, dans l’intérieur du nouveau continent et dans la mer du sud pendant les années 1799, 1800, 1801, 1802 et 1803; par Al. de Humbodt et A. Bonpland. J. Smith and Gide, Paris, 2:225–237, colored plates 48, 50, 53, 54.

Walker, J. M., J. P. Curole, D. E. Wade, E. G. Chapman, A. E. Bogan, G. T. Watters, and W. R. Hoeh. 2006. Taxonomic distribution and phylogenetic utility of gender-associated mitochondrial genomes in the Unionoida (Bivalvia). Malacologia 48:265–282.

Watters, G. T., M. A. Hoggarth, and D. H. Stansbery. 2009. The Freshwater Mussels of Ohio. The Ohio State University Press, Columbus. 421 pp.

Williams, J. D., A. E. Bogan, and J. T. Garner. 2008. The Freshwater Mussels of Alabama and the Mobile Basin of Georgia, Mississippi, and Tennessee. University of Alabama Press, Tuscaloosa. 908 pp.

Williams, J. D., A. E. Bogan, and J. T. Garner. 2009. A new species of freshwater mussel, *Anodonta hartfieldorum* (Bivalvia: Unionidae), from the Gulf Coastal Plain drainages of Alabama, Florida, Louisiana and Mississippi, USA. The Nautilus 123:25–33.

Williams, J. D., R. S. Butler, G. L. Warren, and N. A. Johnson. 2014. Freshwater Mussels of Florida. University of Alabama Press, Tuscaloosa. 498 pp.

Williams, J. D., R. S. Butler, and J. M. Wisniewski. 2011. Annotated synonymy of the recent freshwater mussel taxa of the families Margaritiferidae and Unionidae described from Florida and drainages contiguous with Alabama and Georgia. Bulletin of the Florida Museum of Natural History 51:1–84.

Williams, J. D., and A. Fradkin. 1999. *Fusconaia apalachicola*, a new species of freshwater mussel (Bivalvia: Unionidae) from pre-Columbian archaeological sites in the Apalachicola basin of Alabama, Florida, and Georgia. Tulane Studies in Zoology 31:51–62.

Williams, J. D., M. L. Warren, Jr., K. S. Cummings, J. L. Harris, and R. J. Neves. 1993. Conservation status of the freshwater mussels of the United States and Canada. Fisheries 18:6–22.

Zanatta, D. T., and R. W. Murphy. 2006. Evolution of active host-attraction strategies in the freshwater mussel tribe Lampsilini (Bivalvia: Unionidae). Molecular Phylogenetics and Evolution 41:195–208. doi: 10.1016/j.ympev.2006.05.030

Zanatta, D. T., A. Ngo, and J. Lindell. 2007. Reassessment of the phylogenetic relationships among *Anodonta*, *Pyganodon*, and *Utterbackia* (Bivalvia: Unionoida) using mutation coding of allozyme data. Proceedings of the Academy of Natural Sciences of Philadelphia 156:211–216.

Parks, Caleb

From: Aymond, Angel <angel.aymond@vdot.virginia.gov>
Sent: Friday, October 4, 2019 2:26 PM
To: Parks, Caleb
Subject: Fwd: current Martinsville alignment map

---------- Forwarded message ---------
From: **Alexander, Susan** <susan.alexander@vdot.virginia.gov>
Date: Fri, Apr 5, 2019 at 9:41 AM
Subject: RE: current Martinsville alignment map
To: Angel Aymond <angel.aymond@vdot.virginia.gov>, Amy Golden <amy.golden@vdot.virginia.gov>

Thanks Angel.

I see there has been some adjustment to the proposed alignments. Can you tell me if Route D is a viable option (the dark-blue line on the map)? From what I can see, it looks like Routes D & E will mostly follow the existing Rt. 220 alignment, and D will head west to follow the same alignment as Route C and then B & C up to the northern termini. I want to be sure that I give the correct information and locations where Dr. Angermeier and Dr. Neves can expect to conduct the habitat assessments/surveys for fish and mussels. I have contacted Dr. Angermeier about a cost proposal, but I have not heard from him. I am going to send a follow up and include the current map information as well. I will send the same information to Dr. Neves regarding the mussels. Brian Watson at DGIF recommends at least assessments of the reaches in Marrowbone Creek to see if any protected mussels are there. He does not have any information or data of mussels in this area. There is a chance that Green floater and/or Atlantic pigtoe can be in the Marrowbone drainage.

Thanks for your help on this. Any information you can provide that give a better description of which alignments are most likely to be considered would be great. I see at least 3 for Routes A, B & C, and possibly a 4th crossing of Marrowbone Creek for Option D. Let me know if you have questions.

Susan

From: Aymond, Angel <angel.aymond@vdot.virginia.gov>
Sent: Tuesday, April 2, 2019 9:28 AM
To: Golden, Amy <amy.golden@vdot.virginia.gov>
Cc: Mary Alexander <susan.alexander@vdot.virginia.gov>
Subject: Re: current Martinsville alignment map

VaFWIS Search Report Compiled on 10/3/2019, 3:27:18 PM

Help

Known or likely to occur within a **6 mile radius around point 36,34,48.8 -79,51,40.4** in **089 Henry County, 690 Martinsville City, VA**

View Map of Site Location

391 Known or Likely Species ordered by Status Concern for Conservation (displaying first 20) (18 species with Status* or Tier I** or Tier II**)

BOVA Code	Status*	Tier**	Common Name	Scientific Name	Confirmed	Database(s)
060017	FESE	Ia	Spinymussel, James	Parvaspina collina		BOVA
010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes	BOVA,TEWaters,Habitat,SppObs,HU6
050022	FTST	Ia	Bat, northern long-eared	Myotis septentrionalis		BOVA
050020	SE	Ia	Bat, little brown	Myotis lucifugus		BOVA,HU6
050027	SE	Ia	Bat, tri-colored	Perimyotis subflavus		BOVA
040293	ST	Ia	Shrike, loggerhead	Lanius ludovicianus		BOVA
060081	ST	IIa	Floater, green	Lasmigona subviridis		HU6
010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes	BOVA,TEWaters,HU6
040292	ST		Shrike, migrant loggerhead	Lanius ludovicianus migrans		BOVA
030012	CC	IVa	Rattlesnake, timber	Crotalus horridus		BOVA,HU6
010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes	BOVA,Habitat,SppObs,HU6
100248		Ia	Fritillary, regal	Speyeria idalia idalia		HU6
040052		IIa	Duck, American black	Anas rubripes	Potential	BOVA,BBA,HU6
040320		IIa	Warbler, cerulean	Setophaga cerulea		BOVA,HU6
040140		IIa	Woodcock, American	Scolopax minor	Potential	BOVA,BBA,HU6
040203		IIb	Cuckoo, black-billed	Coccyzus erythropthalmus		BOVA

040105		IIb	Rail, king	Rallus elegans		BOVA
040304		IIc	Warbler, Swainson's	Limnothlypis swainsonii		HU6
010131		IIIa	Eel, American	Anguilla rostrata		BOVA
030068		IIIa	Turtle, woodland box	Terrapene carolina carolina		BOVA,HU6

To view **All 391 species** View 391

*FE=Federal Endangered; FT=Federal Threatened; SE=State Endangered; ST=State Threatened; FP=Federal Proposed; FC=Federal Candidate; CC=Collection Concern

**I=VA Wildlife Action Plan - Tier I - Critical Conservation Need; II=VA Wildlife Action Plan - Tier II - Very High Conservation Need; III=VA Wildlife Action Plan - Tier III - High Conservation Need;
IV=VA Wildlife Action Plan - Tier IV - Moderate Conservation Need
Virginia Widlife Action Plan Conservation Opportunity Ranking:
a - On the ground management strategies/actions exist and can be feasibly implemented.;
b - On the ground actions or research needs have been identified but cannot feasibly be implemented at this time.;
c - No on the ground actions or research needs have been identified or all identified conservation opportunities have been exhausted.

View Map of All Query Results from All Observation Tables

Bat Colonies or Hibernacula: **Not Known**

Anadromous Fish Use Streams

N/A

Impediments to Fish Passage

N/A

Colonial Water Bird Survey

N/A

Threatened and Endangered Waters

(43 Reaches - displaying first 20) **View Map of All Threatened and Endangered Waters**

Stream Name	T&E Waters Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
Smith River (0329763)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch,	Percina rex	

					Roanoke		
Smith River (0329782)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329845)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329953)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329964)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0329986)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0330010)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0330185)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0330192)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331179)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331215)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	

Smith River (0331216)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331231)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331245)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331339)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331357)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0331460)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0332489)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0332495)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0332596)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0332607)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	

Smith River (0332617)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (0332619)	FESE	010127	ST	IIb	Madtom, orangefin	Noturus gilberti	Yes

To view **All 43 Threatened and Endangered Waters records** View 43

Managed Trout Streams (1 records) (Click on Stream Name to view complete reach history) **View Map of All Trout Stream Surveys**

Reach ID	Stream Name	Class	Brook Trout	Brown Trout	Rainbow Trout	View Map
05SRE-01	Smith River	Wild trout		Y		Yes

Bald Eagle Concentration Areas and Roosts

N/A

Bald Eagle Nests

N/A

Species Observations (121 records - displaying first 20 , 5 Observations with Threatened or Endangered species) **View Map of All Query Results Species Observations**

obsID	class	Date Observed	Observer	N Species: Different Species	N Species: Highest TE*	N Species: Highest Tier**	View Map
622501	SppObs	Oct 13 2014	Greg; Anderson| Brandon; Plunkett| AJ; Barnard| Zoey; Car	16	FESE	II	Yes
315307	SppObs	Jul 1 1999	DEQ	25	FESE	II	Yes
315308	SppObs	Jul 1 1999	DEQ	21	FESE	II	Yes
55294	SppObs	Sep 21 1998	Scott Smith, VDGIF	1	FESE	II	Yes
55295	SppObs	Sep 21 1998	Scott Smith, VDGIF	1	FESE	II	Yes
621262	SppObs	Sep 3 2013	Jamie; Roberts	1		I	Yes
315309	SppObs	Jul 1 1999	DEQ	25		I	Yes
315310	SppObs	Jul 1 1999	DEQ	22		I	Yes

337084	SppObs	Jan 1 1981	REJ-B-JENKINS	22		I	Yes
613951	SppObs	Sep 20 2011	Christopher; Plummer| Brock; Reggi	24		IV	Yes
600325	SppObs	Aug 26 2009	Jason; Hill| Drew; Miller	29		IV	Yes
601913	SppObs	Oct 23 2008	Jason Hill and Mike Hutch	13		IV	Yes
67342	SppObs	Jun 4 2002	RICHARD NEVES AND MELLISSA PETTY, VA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT	9		IV	Yes
65923	SppObs	Jun 4 2002	Aaron Liberty, Brett Ostby, and Melissa Petty (collectors)	8		IV	Yes
67341	SppObs	Jun 4 2002	RICHARD NEVES AND MELLISSA PETTY, VA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT	7		IV	Yes
67387	SppObs	May 24 2002	RICHARD J. NEVES AND MELISSA PETTY, VA COOPERATIVE FISH AND WILDLIFE RESEARCH UNIT	10		IV	Yes
58211	SppObs	Aug 18 1999	Ryan W. Boggs and Louis Seivard (principle permittee), Dept. of Environmental Quality	2		IV	Yes
10520	SppObs	Jul 29 1977	Frankensteen	7		IV	Yes
10517	SppObs	Jul 27 1977	Frankensteen	11		IV	Yes
10516	SppObs	Jul 27 1977	Frankensteen	7		IV	Yes

Displayed 20 Species Observations

Selected 121 Observations View all 121 Species Observations

Habitat Predicted for Aquatic WAP Tier I & II Species (24 Reaches - displaying first 20)

View Map Combined Reaches from Below of Habitat Predicted for WAP Tier I & II Aquatic Species

Stream Name	Tier Species						View Map
	Highest TE*	BOVA Code, Status*, Tier**, Common & Scientific Name					
Cobbs Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Drag Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Fall Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Fall Creek (30101032)	FESE	010214	FESE	IIa	Logperch,	Percina	Yes

					Roanoke	rex	
Leatherwood Creek (30101031)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Leatherwood Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Leatherwood Creek (30101032)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Little Marrowbone Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Marrowbone Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Marrowbone Creek (30101031)		010432			Madtom, spotted-margin	Noturus insignis ssp 1	Yes
Marrowbone Creek (30101032)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Marrowbone Creek (30101032)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Marrowbone Creek (30101032)		010432			Madtom, spotted-margin	Noturus insignis ssp 1	Yes
Matrimony Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Middle Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
Mulberry Creek (30101031)	FESE	010214	FESE	IIa	Logperch, Roanoke	Percina rex	Yes
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Mulberry Creek (30101031)		010432			Madtom,	Noturus	Yes

					spotted-margin	insignis ssp 1	
Smith River (30101031)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Smith River (30101031)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (30101031)		010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
Smith River (30101032)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
		010432			Madtom, spotted-margin	Noturus insignis ssp 1	
Smith River (30101032)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes
		010214	FESE	IIa	Logperch, Roanoke	Percina rex	
Smith River (30101032)	FESE	010174		Ia	Bass, Roanoke	Ambloplites cavifrons	Yes

To view **All 24 Tier Reaches records records** View 24

Habitat Predicted for Terrestrial WAP Tier I & II Species

N/A

Virginia Breeding Bird Atlas Blocks (5 records)

View Map of All Query Results
Virginia Breeding Bird Atlas Blocks

BBA ID	Atlas Quadrangle Block Name	Breeding Bird Atlas Species			View Map
		Different Species	Highest TE *	Highest Tier **	
32026	Martinsville East, SE	60		III	Yes
32025	Martinsville East, SW	1			Yes
31026	Martinsville West, SE	65		II	Yes
32014	Northwest Eden, CE	48		III	Yes
31014	Price, CE	50		III	Yes

Public Holdings:

N/A

Summary of BOVA Species Associated with Cities and Counties of the Commonwealth of Virginia:

FIPS Code	City and County Name	Different Species	Highest TE	Highest Tier
089	Henry	329	FESE	I
690	Martinsville City	285	FTSE	I

USGS 7.5' Quadrangles:
Price
Martinsville West
Northwest Eden
Martinsville East

USGS NRCS Watersheds in Virginia:

N/A

USGS National 6th Order Watersheds Summary of Wildlife Action Plan Tier I, II, III, and IV Species:

HU6 Code	USGS 6th Order Hydrologic Unit	Different Species	Highest TE	Highest Tier
RD11	Horse Pasture Creek	50	FESE	I
RD12	North Mayo River-Koger Creek	57	FESE	I
RD13	Mayo River-Pawpaw Creek	45	FESE	I
RD14	Dan River-Matrimony Creek	46	FESE	I
RD24	Smith River-Beaver Creek	56	FESE	I
RD25	Marrowbone Creek	47	FESE	I
RD26	Smith River-Mulberry Creek	48	FESE	I
RD29	Lower Leatherwood Creek	46	FESE	I
RD30	Smith River-Fall Creek	47	FESE	I

Compiled on 10/3/2019, 3:27:18 PM I995621.0 report=all searchType= R dist= 9654 poi= 36,34,48.8 -79,51,40.4

PixelSize=64; Anadromous=0.036035; BBA=0.091425; BECAR=0.032772; Bats=0.033044; Buffer=1.055917; County=0.112366; HU6=0.151999; Impediments=0.034569; Init=1.167105; PublicLands=0.045956; Quad=0.115413; SppObs=0.491544; TEWaters=0.077319; TierReaches=0.122627; TierTerrestrial=0.290207; Total=3.139664; Tracking_BOVA=0.167667; Trout=0.075477; huva=0.083453

FARMLAND CONVERSION IMPACT RATINGS

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request **6/12/19**	4. Sheet 1 of **1**
1. Name of Project **Martinsville Southern Connector Study**	5. Federal Agency Involved **FHWA**	
2. Type of Project **Corridor**	6. County and State **Henry County, VA**	
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS **6/26/19**	2. Person Completing Form **M. Louise Jacques**
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☑ NO ☐	4. Acres Irrigated **0**	Average Farm Size 148 acres
5. Major Crop(s) **Corn**	6. Farmable Land in Government Jurisdiction Acres: **171,205** % **67.8**	7. Amount of Farmland As Defined in FPPA Acres: 6,640 % **47.3**
8. Name Of Land Evaluation System Used **LESA**	9. Name of Local Site Assessment System **N/A**	10. Date Land Evaluation Returned by NRCS **7/15/19**

PART III *(To be completed by Federal Agency)*		Alternative Corridor For Segment Corridor A			
		Corridor A	Corridor B	Corridor C	Corridor D
A. Total Acres To Be Converted Directly		93			
B. Total Acres To Be Converted Indirectly, Or To Receive Services					
C. Total Acres In Corridor		492			
PART IV *(To be completed by NRCS) Land Evaluation Information*					
A. Total Acres Prime And Unique Farmland		9.71			
B. Total Acres Statewide And Local Important Farmland		258			
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted		0.0			
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value		65.1			
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)*		55			
PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	Maximum Points				
1. Area in Nonurban Use	15	15			
2. Perimeter in Nonurban Use	10	10			
3. Percent Of Corridor Being Farmed	20	0			
4. Protection Provided By State And Local Government	20	0			
5. Size of Present Farm Unit Compared To Average	10	10			
6. Creation Of Nonfarmable Farmland	25	0			
7. Availablility Of Farm Support Services	5	5			
8. On-Farm Investments	20	0			
9. Effects Of Conversion On Farm Support Services	25	0			
10. Compatibility With Existing Agricultural Use	10	0			
TOTAL CORRIDOR ASSESSMENT POINTS	160	40	0	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	55	0	0	0
Total Corridor Assessment (From Part VI above or a local site assessment)	160	40	0	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	95	0	0	0

1. Corridor Selected: **A preferred Alt. has not been selected.**	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used? YES ☐ NO ☐

5. Reason For Selection:

Signature of Person Completing this Part:

DATE

NOTE: Complete a form for each segment with more than one Alternate Corridor

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor - type site or design alternative for protection as farmland along with the land evaluation information.

(1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?
More than 90 percent - 15 points
90 to 20 percent - 14 to 1 point(s)
Less than 20 percent - 0 points

(2) How much of the perimeter of the site borders on land in nonurban use?
More than 90 percent - 10 points
90 to 20 percent - 9 to 1 point(s)
Less than 20 percent - 0 points

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?
More than 90 percent - 20 points
90 to 20 percent - 19 to 1 point(s)
Less than 20 percent - 0 points

(4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?
Site is protected - 20 points
Site is not protected - 0 points

(5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County ?
(Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage or Farm Units in Operation with $1,000 or more in sales.)
As large or larger - 10 points
Below average - deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average - 9 to 0 points

(6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?
Acreage equal to more than 25 percent of acres directly converted by the project - 25 points
Acreage equal to between 25 and 5 percent of the acres directly converted by the project - 1 to 24 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project - 0 points

(7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?
All required services are available - 5 points
Some required services are available - 4 to 1 point(s)
No required services are available - 0 points

(8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?
High amount of on-farm investment - 20 points
Moderate amount of on-farm investment - 19 to 1 point(s)
No on-farm investment - 0 points

(9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?
Substantial reduction in demand for support services if the site is converted - 25 points
Some reduction in demand for support services if the site is converted - 1 to 24 point(s)
No significant reduction in demand for support services if the site is converted - 0 points

(10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?
Proposed project is incompatible to existing agricultural use of surrounding farmland - 10 points
Proposed project is tolerable to existing agricultural use of surrounding farmland - 9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland - 0 points

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request 6/12/19		4. Sheet 1 of 1
1. Name of Project Martinsville Southern Connector Study	5. Federal Agency Involved FHWA		
2. Type of Project Corridor	6. County and State Henry County, VA		
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS 6/26/19		2. Person Completing Form M. Louise Jacques
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☑ NO ☐			4. Acres Irrigated 0 / Average Farm Size 149 acres
5. Major Crop(s) Corn	6. Farmable Land in Government Jurisdiction Acres: 171,205 % 67.8		7. Amount of Farmland As Defined in FPPA Acres: 6,640 % 47.3
8. Name Of Land Evaluation System Used LESA	9. Name of Local Site Assessment System N/A		10. Date Land Evaluation Returned by NRCS 7/15/19

PART III *(To be completed by Federal Agency)*	Maximum Points	Corridor A	Corridor B	Corridor C	Corridor D
		Alternative Corridor For Segment Corridor B			
A. Total Acres To Be Converted Directly			39.5		
B. Total Acres To Be Converted Indirectly, Or To Receive Services					
C. Total Acres In Corridor			480		
PART IV *(To be completed by NRCS) Land Evaluation Information*					
A. Total Acres Prime And Unique Farmland			66		
B. Total Acres Statewide And Local Important Farmland			336.4		
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted			0.0		
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value			63.4		
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)*			59		
PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	Maximum Points				
1. Area in Nonurban Use	15		15		
2. Perimeter in Nonurban Use	10		10		
3. Percent Of Corridor Being Farmed	20		0		
4. Protection Provided By State And Local Government	20		0		
5. Size of Present Farm Unit Compared To Average	10		10		
6. Creation Of Nonfarmable Farmland	25		0		
7. Availablility Of Farm Support Services	5		5		
8. On-Farm Investments	20		0		
9. Effects Of Conversion On Farm Support Services	25		0		
10. Compatibility With Existing Agricultural Use	10		0		
TOTAL CORRIDOR ASSESSMENT POINTS	160	0	40	0	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	0	59	0	0
Total Corridor Assessment (From Part VI above or a local site assessment)	160	0	40	0	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	99	0	0

1. Corridor Selected: **A preferred Alt. has not been selected.**	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used? YES ☐ NO ☐

5. Reason For Selection:

Signature of Person Completing this Part: | DATE

NOTE: Complete a form for each segment with more than one Alternate Corridor

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor - type site or design alternative for protection as farmland along with the land evaluation information.

(1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?
More than 90 percent - 15 points
90 to 20 percent - 14 to 1 point(s)
Less than 20 percent - 0 points

(2) How much of the perimeter of the site borders on land in nonurban use?
More than 90 percent - 10 points
90 to 20 percent - 9 to 1 point(s)
Less than 20 percent - 0 points

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?
More than 90 percent - 20 points
90 to 20 percent - 19 to 1 point(s)
Less than 20 percent - 0 points

(4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?
Site is protected - 20 points
Site is not protected - 0 points

(5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County ? (Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage or Farm Units in Operation with $1,000 or more in sales.)
As large or larger - 10 points
Below average - deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average - 9 to 0 points

(6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?
Acreage equal to more than 25 percent of acres directly converted by the project - 25 points
Acreage equal to between 25 and 5 percent of the acres directly converted by the project - 1 to 24 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project - 0 points

(7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?
All required services are available - 5 points
Some required services are available - 4 to 1 point(s)
No required services are available - 0 points

(8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?
High amount of on-farm investment - 20 points
Moderate amount of on-farm investment - 19 to 1 point(s)
No on-farm investment - 0 points

(9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?
Substantial reduction in demand for support services if the site is converted - 25 points
Some reduction in demand for support services if the site is converted - 1 to 24 point(s)
No significant reduction in demand for support services if the site is converted - 0 points

(10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?
Proposed project is incompatible to existing agricultural use of surrounding farmland - 10 points
Proposed project is tolerable to existing agricultural use of surrounding farmland - 9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland - 0 points

U.S. DEPARTMENT OF AGRICULTURE
Natural Resources Conservation Service

NRCS-CPA-106
(Rev. 1-91)

FARMLAND CONVERSION IMPACT RATING FOR CORRIDOR TYPE PROJECTS

PART I *(To be completed by Federal Agency)*	3. Date of Land Evaluation Request **6/12/19**	4. Sheet 1 of **1**	
1. Name of Project **Martinsville Southern Connector Study**	5. Federal Agency Involved **FHWA**		
2. Type of Project **Corridor**	6. County and State **Henry County, VA**		
PART II *(To be completed by NRCS)*	1. Date Request Received by NRCS **6/26/19**	2. Person Completing Form **M. Louise Jacques**	
3. Does the corridor contain prime, unique statewide or local important farmland? (If no, the FPPA does not apply - Do not complete additional parts of this form). YES ☑ NO ☐		4. Acres Irrigated **0**	Average Farm Size 148 acres
5. Major Crop(s) **Corn**	6. Farmable Land in Government Jurisdiction Acres: **171,205** % **67.8**	7. Amount of Farmland As Defined in FPPA Acres: 6,640 % 47.3	
8. Name Of Land Evaluation System Used **LESA**	9. Name of Local Site Assessment System **N/A**	10. Date Land Evaluation Returned by NRCS **7/15/19**	

PART III *(To be completed by Federal Agency)*	Maximum Points	Corridor A	Corridor B	Corridor C	Corridor D
		Alternative Corridor For Segment Corridor C			
A. Total Acres To Be Converted Directly				49	
B. Total Acres To Be Converted Indirectly, Or To Receive Services					
C. Total Acres In Corridor				447	
PART IV *(To be completed by NRCS) Land Evaluation Information*					
A. Total Acres Prime And Unique Farmland				52.7	
B. Total Acres Statewide And Local Important Farmland				302	
C. Percentage Of Farmland in County Or Local Govt. Unit To Be Converted				0.0	
D. Percentage Of Farmland in Govt. Jurisdiction With Same Or Higher Relative Value				63.4	
PART V *(To be completed by NRCS) Land Evaluation Information Criterion Relative value of Farmland to Be Serviced or Converted (Scale of 0 - 100 Points)*				58	
PART VI *(To be completed by Federal Agency) Corridor Assessment Criteria (These criteria are explained in 7 CFR 658.5(c))*	**Maximum Points**				
1. Area in Nonurban Use	15			15	
2. Perimeter in Nonurban Use	10			10	
3. Percent Of Corridor Being Farmed	20			0	
4. Protection Provided By State And Local Government	20			0	
5. Size of Present Farm Unit Compared To Average	10			10	
6. Creation Of Nonfarmable Farmland	25			0	
7. Availablility Of Farm Support Services	5			5	
8. On-Farm Investments	20			0	
9. Effects Of Conversion On Farm Support Services	25			0	
10. Compatibility With Existing Agricultural Use	10			0	
TOTAL CORRIDOR ASSESSMENT POINTS	160	0	0	40	0
PART VII *(To be completed by Federal Agency)*					
Relative Value Of Farmland (From Part V)	100	0	0	58	0
Total Corridor Assessment (From Part VI above or a local site assessment)	160	0	0	40	0
TOTAL POINTS *(Total of above 2 lines)*	260	0	0	98	0

1. Corridor Selected: **A preferred Alt. has not been selected.**	2. Total Acres of Farmlands to be Converted by Project:	3. Date Of Selection:	4. Was A Local Site Assessment Used? YES ☐ NO ☐

5. Reason For Selection:

Signature of Person Completing this Part: | DATE

NOTE: Complete a form for each segment with more than one Alternate Corridor

CORRIDOR - TYPE SITE ASSESSMENT CRITERIA

The following criteria are to be used for projects that have a linear or corridor - type site configuration connecting two distant points, and crossing several different tracts of land. These include utility lines, highways, railroads, stream improvements, and flood control systems. Federal agencies are to assess the suitability of each corridor - type site or design alternative for protection as farmland along with the land evaluation information.

(1) How much land is in nonurban use within a radius of 1.0 mile from where the project is intended?
More than 90 percent - 15 points
90 to 20 percent - 14 to 1 point(s)
Less than 20 percent - 0 points

(2) How much of the perimeter of the site borders on land in nonurban use?
More than 90 percent - 10 points
90 to 20 percent - 9 to 1 point(s)
Less than 20 percent - 0 points

(3) How much of the site has been farmed (managed for a scheduled harvest or timber activity) more than five of the last 10 years?
More than 90 percent - 20 points
90 to 20 percent - 19 to 1 point(s)
Less than 20 percent - 0 points

(4) Is the site subject to state or unit of local government policies or programs to protect farmland or covered by private programs to protect farmland?
Site is protected - 20 points
Site is not protected - 0 points

(5) Is the farm unit(s) containing the site (before the project) as large as the average - size farming unit in the County ? (Average farm sizes in each county are available from the NRCS field offices in each state. Data are from the latest available Census of Agriculture, Acreage or Farm Units in Operation with $1,000 or more in sales.)
As large or larger - 10 points
Below average - deduct 1 point for each 5 percent below the average, down to 0 points if 50 percent or more below average - 9 to 0 points

(6) If the site is chosen for the project, how much of the remaining land on the farm will become non-farmable because of interference with land patterns?
Acreage equal to more than 25 percent of acres directly converted by the project - 25 points
Acreage equal to between 25 and 5 percent of the acres directly converted by the project - 1 to 24 point(s)
Acreage equal to less than 5 percent of the acres directly converted by the project - 0 points

(7) Does the site have available adequate supply of farm support services and markets, i.e., farm suppliers, equipment dealers, processing and storage facilities and farmer's markets?
All required services are available - 5 points
Some required services are available - 4 to 1 point(s)
No required services are available - 0 points

(8) Does the site have substantial and well-maintained on-farm investments such as barns, other storage building, fruit trees and vines, field terraces, drainage, irrigation, waterways, or other soil and water conservation measures?
High amount of on-farm investment - 20 points
Moderate amount of on-farm investment - 19 to 1 point(s)
No on-farm investment - 0 points

(9) Would the project at this site, by converting farmland to nonagricultural use, reduce the demand for farm support services so as to jeopardize the continued existence of these support services and thus, the viability of the farms remaining in the area?
Substantial reduction in demand for support services if the site is converted - 25 points
Some reduction in demand for support services if the site is converted - 1 to 24 point(s)
No significant reduction in demand for support services if the site is converted - 0 points

(10) Is the kind and intensity of the proposed use of the site sufficiently incompatible with agriculture that it is likely to contribute to the eventual conversion of surrounding farmland to nonagricultural use?
Proposed project is incompatible to existing agricultural use of surrounding farmland - 10 points
Proposed project is tolerable to existing agricultural use of surrounding farmland - 9 to 1 point(s)
Proposed project is fully compatible with existing agricultural use of surrounding farmland - 0 points

LAND USE PATTERN ASSUMPTIONS

Commonwealth of Virginia

Aymond, Angel <angel.aymond@vdot.virginia.gov>

RE: US 220 EIS land use pattern assumption

1 message

Leah Manning <lmanning@wppdc.org> Tue, Jul 23, 2019 at 11:50 AM
To: "Xiao, Peng" <peng.xiao@vdot.virginia.gov>
Cc: "Smizik, Scott" <scott.smizik@vdot.virginia.gov>, Angel Aymond <angel.aymond@vdot.virginia.gov>, "Ben Mannell, AICP" <Ben.Mannell@vdot.virginia.gov>

Good morning,

In follow up to your request, please note the attached file with tracked changes. Based on the information provided, we would agree with your assumptions on the land use patterns. Thank you for the opportunity to review this piece.

Please let us know if we may be of further assistance.

Sincerely,

Leah

Leah Manning, Deputy Director/Regional Economic Development Planner

West Piedmont Planning District Commission

P. O. Box 5268

1100 Madison Street

Martinsville, VA 24115

Ph: 276.638.3987

Fx: 276.638.8137

lmanning@wppdc.org

www.wppdc.org

From: Xiao, Peng <peng.xiao@vdot.virginia.gov>
Sent: Friday, July 19, 2019 10:12 AM
To: Leah Manning <lmanning@wppdc.org>
Cc: Smizik, Scott <scott.smizik@vdot.virginia.gov>; Angel Aymond <angel.aymond@vdot.virginia.gov>; Ben Mannell, AICP <Ben.Mannell@vdot.virginia.gov>
Subject: US 220 EIS land use pattern assumption

Good morning Leah,

As you might know, recently, VDOT Environment division conduct environmental impact study of US220 from north Carolina boundary to US58, the consultant team developed a subarea model using some assumption for the land use data pattern, we would like your agreement regarding this assumption. Please see attached file, at the bottom of 3rd. page. and let us know if you have any questions or comments.

Best regards

Peng Xiao

PE, PTOE, PMP

Modeling & Accessibility Program Manager

1401 E. broad St. Richmond,VA 23219

Phone:(804)786-0998

Fax:(804)-225-4785

2019-04-30 FOReCASTING PROCESS AND MODEL CALIBRATION section no tables.docx
819K

<u>LOCATION APPROVAL FOR THE</u>
<u>MARTINSVILLE SOUTHERN CONNECTOR STUDY</u>

COMMONWEALTH of VIRGINIA

Commonwealth Transportation Board

Shannon Valentine
Chairperson

1401 East Broad Street
Richmond, Virginia 23219

(804) 786-2701
Fax: (804) 786-2940

***Agenda Item** 20*

RESOLUTION
OF THE
COMMONWEALTH TRANSPORTATION BOARD

January 15, 2020

MOTION

Made By: Dr. Smoot, Seconded By: Mr. Kasprowicz
Action: Motion Carried, Unanimously

Title: Location Approval for the Martinsville Southern Connector Study

WHEREAS, a Draft Environmental Impact Statement (Draft EIS) has been developed in accordance with the National Environmental Policy Act (NEPA) for the Martinsville Southern Connector Study (MSC); and

WHEREAS, funding for the MSC came from repurposed federal earmarks as the Commonwealth Transportation Board (CTB) was beginning the implementation of the SMART SCALE prioritization process; and

WHEREAS, it is unlikely a project resulting from the MSC would be funded under existing state funding programs; and

WHEREAS, based on the MSC's designation under One Federal Decision by the Federal Highway Administration (FHWA), it is the CTB's expectation that a project resulting from the MSC would be a priority project for FHWA administered federal funding in the future to the extent practicable; and

WHEREAS, in order to ensure all information to support permit applications is presented to the agencies and the public, the preferred alternative is to be identified in the Draft EIS; and

WHEREAS, VDOT held two Citizen Information Meetings on May 8, 2018 and January 23, 2019 for the purpose of sharing information and soliciting public input on the development of key components of the study for incorporation in the Draft EIS; and

WHEREAS, in accordance with the statutes of the Commonwealth of Virginia and policies of the CTB, a Location Public Hearing was held in Henry County at Drewry Mason Elementary School on August 15, 2019 for the purpose of soliciting public input on the recommended preferred alternative (Alternative C); and

WHEREAS, proper notice was given in advance, and all those present were given a full opportunity to express their opinions and recommendations on the alternatives under consideration, and their statements have been duly recorded and considered by the CTB; and

WHEREAS, the economic, social, and environmental effects of the evaluated alternatives have been examined and given proper consideration and this evidence, along with all other, has been carefully reviewed; and

WHEREAS, on September 24, 2019 the Henry County Board of Supervisors voted unanimously to endorse Alternative C as the Preferred Alternative along with a request to consider adjusting the route to align west of 3375 Joseph Martin Highway; and

WHEREAS, other letters of support have been received from the Cities of Roanoke and Martinsville; the Counties of Franklin and Roanoke; Martinsville Henry County Chamber of Commerce; West Piedmont Planning District Commission; Delegates Les Adams, Charles Poindexter, and Danny Marshall; and Senator William Stanley; and

WHEREAS, collaboration among VDOT, FHWA, the U.S. Army Corps of Engineers , and the U.S. Environmental Protection Agency resulted in the recommendation for Alternative C to be identified as the Preferred Alternative; and

NOW, THEREFORE, BE IT RESOLVED that the location of this project be approved as presented under Alternative C in the Draft EIS.

BE IT FURTHER RESOLVED that VDOT is directed to further analyze Alternative C to evaluate whether adjustments can measurably reduce impacts to properties as requested by Henry County and still result in a permittable project.

BE IT FURTHER RESOLVED that the CTB's decision expires three years after the completion of the Final EIS unless any project resulting from the MSC is fully funded for construction by or before that date, at which point its decision will be rescinded or revised.

BE IT FURTHER RESOLVED that should the CTB's decision for a highway expire, the project website will be archived, including any mapping or identification of the preferred alternative, and shall be removed from any publically available information under the control of VDOT.

BE IT FURTHER RESOLVED that any further commitment of funding for project resulting from the MSC, whether federal or state, must be approved by the CTB prior to entering into that commitment.

BE IT FURTHER RESOLVED that VDOT is directed to review and recommend to the CTB whether location decisions issued by the CTB should remain valid for a period of three years from the completion of NEPA unless full funding for construction is secured.

BE IT FURTHER RESOLVED that VDOT, within 120 days, must review the applicable NEPA regulations and implementing guidance for establishing the Purpose and Need of a project to assess its consistency with the CTB's relevant policies pertaining to Purpose and Need for SMART SCALE and VTRANS.

# # #

APPENDIX D

List of Technical Reports & Supporting Documentation

LIST OF TECHNICAL REPORTS

Air Quality Technical Report

Alternatives Analysis Technical Report

Architectural History Survey

Draft Section 4(f) Evaluation

Hazardous Materials Technical Report

Indirect and Cumulative Effects Technical Report

Natural Resources Technical Report

Noise Analysis Technical Report

Phase I A Archaeological Survey

Socioeconomic and Land Use Technical Report

Traffic and Transportation Technical Report